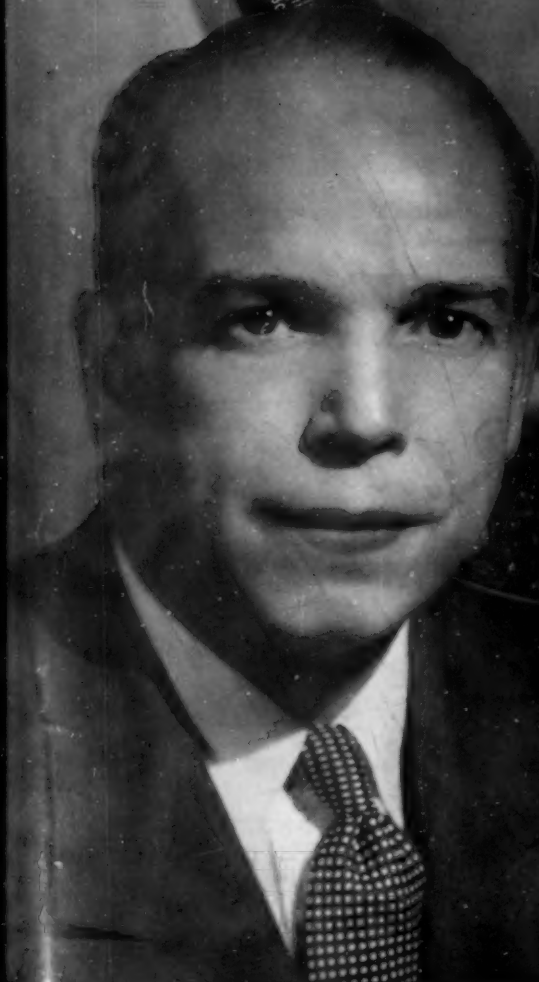


# *The* Tool Engineer



QUALITY CONTROL

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL



ENGINEERS

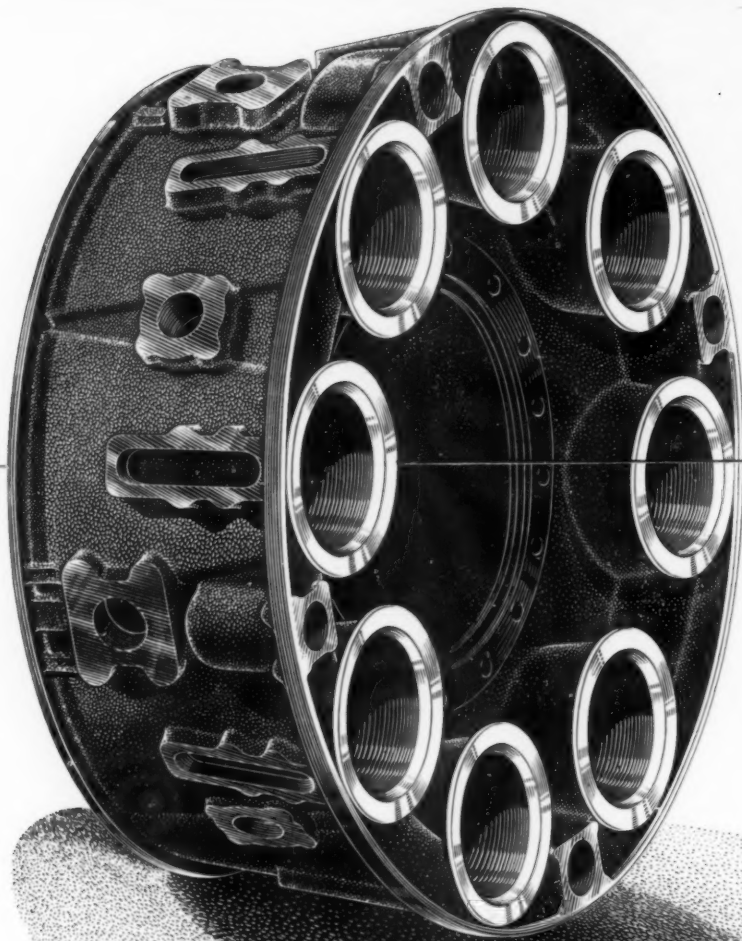
JULY, 1953

PLANNING  
ENGINEERING  
CONTROL

OF

TOOLING  
EQUIPMENT  
PRODUCTION

Cover: G. Gordon Troxler, vice president of The Hoover Co., has



# Jet Aircraft Part Gets 40 BORIZING OPERATIONS *in 12 minutes*



**M**AKING DIFFICULT JOBS easy is a Heald specialty. Here's a typical example.

Eight circular flanges on this jet-engine compressor frame require *five* individual borizing operations to very close tolerances. Yet with the Heald way-type Bore-Matic shown at the left, the entire job—including loading and unloading—takes only 12 minutes per part.

The number 3 size way leg unit, with rotary fixture mounted low on

the base, simplifies loading of the heavy, awkward part. The rotary fixture is manually indexed and positioned by an air-operated locator pin with foot-valve control. Operations performed include chamfering, turning, facing, forming and blending two radii. Borizing operations at each of the eight positions are completely automatic.

*Remember*, when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary  
Surface Grinding Machines  
and Bore-Matics



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WORCESTER 6, MASSACHUSETTS

Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



Cover: G. Gordon Troxler, vice president of The Hoover Co., has been instrumental in the development of the quality control program discussed in the article beginning on Page 69. Shown on the comparator is one of many where rejects have been reduced effectively.



# The Tool Engineer

Volume XXXI, No. 1

July, 1953

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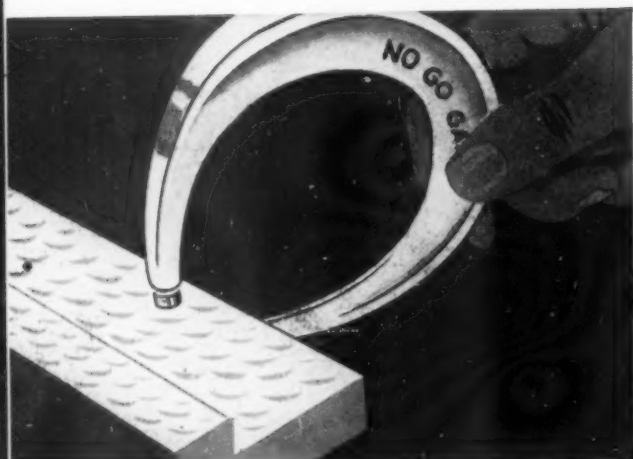
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## AMERICAN SOCIETY OF TOOL ENGINEERS

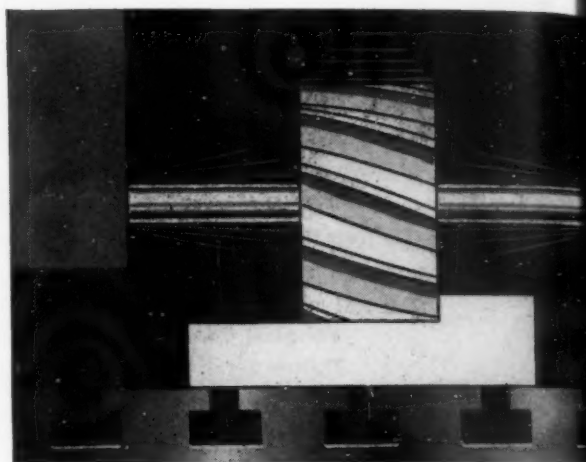
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OFFICE OF PUBLICATION: 239 E. Chicago St., Milwaukee, Wis.  
EXECUTIVE AND EDITORIAL OFFICES: 10700 Puritan Ave., Detroit 21, Michigan.

# HOW TO END DAMAGED WAYS, PRODUCTION LOSSES

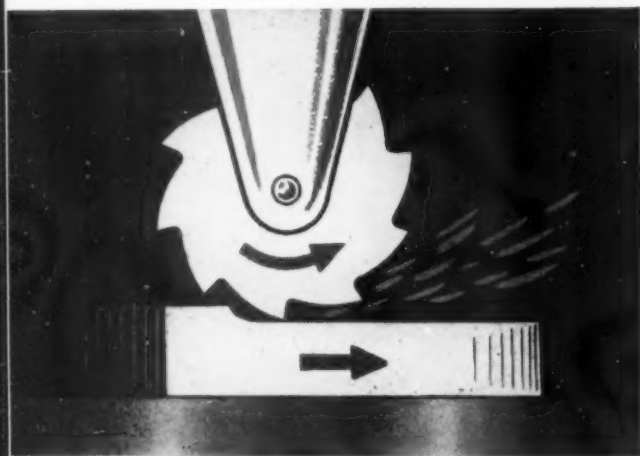
## Sunoco Way Lubricant Stops "Jumpy Table"



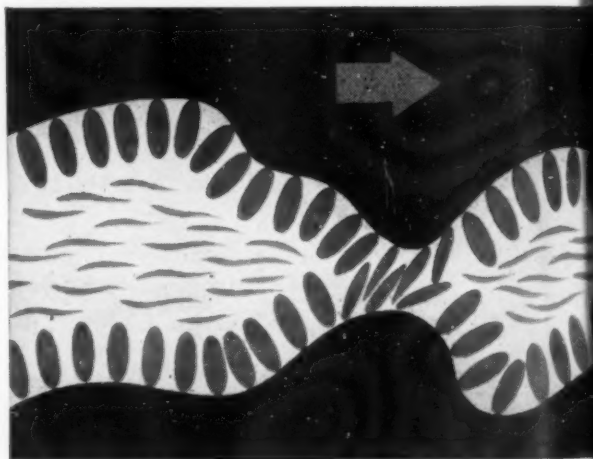
Tool chatter and jumpy table are machining headaches. Too often they cause poor surface finish, failure to hold tolerances, production losses.



Tool chatter is a result of a lack of rigidity in either the machine or the set-up. It is a mechanical problem and no lubricant can lick it.



Jumpy table is a stick... slip... stick... slip action of the table. It is a lubrication problem. Though just as damaging as tool chatter, it is not always detected when the cause of poor surface finishes.



*Extreme magnification*  
Sunoco Way Lubricant cures jumpy table. It contains special compounds that form a film, like the nap of a rug, on the sliding surfaces and minimize the force of both static and kinetic friction.

Why take a chance of damaging your ways? These integral parts of the base casting for your machine are difficult to refinish and costly to replace. For information about Sunoco Way Lubricant, call a Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. TE-7.

INDUSTRIAL PRODUCTS DEPARTMENT  
**SUN OIL COMPANY**



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## THE TOOL ENGINEER

Publication of The  
American Society of  
Tool Engineers  
10700 Puritan Ave.  
Detroit 21, Mich.

# The Tool Engineer

## Contributing to Progress

It is natural to look to institutions of learning and professional societies for research, analysis of pertinent data and dissemination of information. Such has always been their traditional role and industry generally has supported these activities for the benefit of all.

Occasionally, an individual company that has developed valuable information not only makes the data available to industry but also provides for its dissemination through forums or seminars conducted by the company. An outstanding and noteworthy example is the series of two-day seminars on metal-cutting conducted by the Jones and Lamson Machine Co. at its Springfield plant.

Held monthly, these seminars are attended by tool engineers in groups ranging between 15 and 40 engineers, each group being from a different industrial area. Experts on metal-cutting discuss the advantages and possibilities of high-speed cutting, showing with the aid of photomicrographs how speeds above 600 feet per minute minimize the structural disturbances within the workpiece. Actual tests demonstrate how the cutting forces decrease with increased speeds and allow for removing more metal without increasing the horsepower proportionately. In addition, better surface finish and closer size control are achieved.

Also discussed at length at these meetings are the effects of rake and clearance angles on tool performance and the general considerations of the economics of tool life with respect to tool costs and the number of pieces per grind.

These discussions and demonstrations clearly show that most shops are using obsolete standards for metal-cutting. The savings can be extremely worthwhile for those operations that justify the most effective tooling in the high-speed cutting ranges.


*John W. Greve*

EDITOR





# DIALIZE and ECONOMIZE

Any AGD Adjustable Limit Snap Gage  
becomes a DIAL INDICATOR Snap Gage  
with a  **STANDARD**

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Itself!...**

By removing a pair of pins from the snap gage and inserting a STANDARD Dializer any make of AGD Snap Gage in any model, A, B or C, is instantly converted to a DIAL Snap Gage. Dializer is easily transferred from one frame to another.

Dializers are available for complete range of AGD Adjustable Limit Snap Gages (MODELS A, B or C)

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No. 3 Dializers also fit larger size frames beyond AGD size range (available from STANDARD) for dimensions up through 26 $\frac{3}{8}$ ".

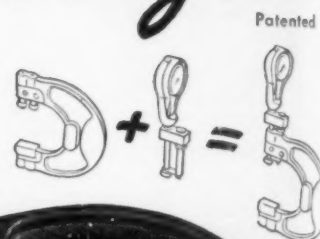
**ACCURACY ASSURED** by double reed principle.

**RANGE OF ADJUSTMENT** of gage is unaffected.

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**Dialize Your LENGTH  
GAGES, too!**

Dializers can also be used on any AGD Adjustable Limit Length Gage, Progressive Type for internal or external measurements.

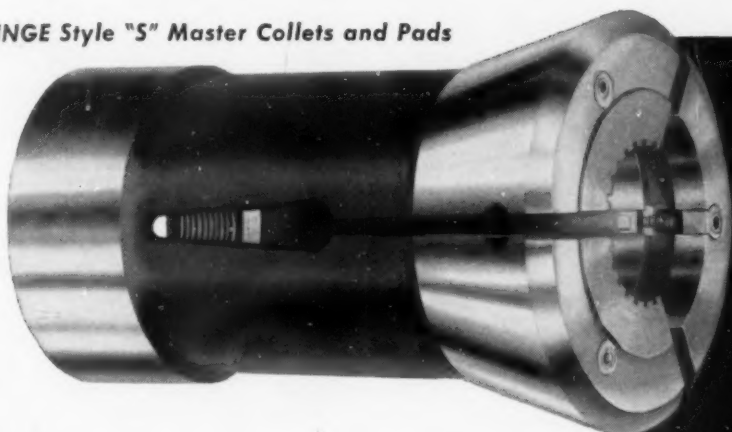


## STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

**HARDINGE**  
ELMIRA, N.Y.

# MASTER COLLETS AND FEED FINGERS For Progressive Screw Machine Plants

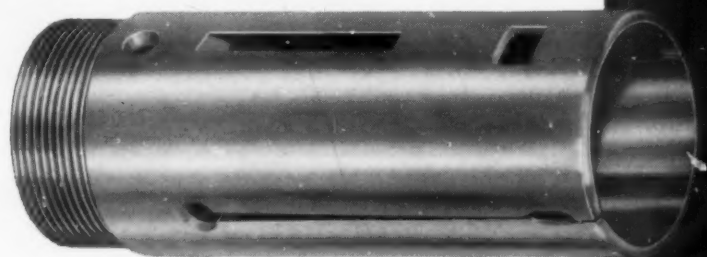
*HARDINGE Style "S" Master Collets and Pads*



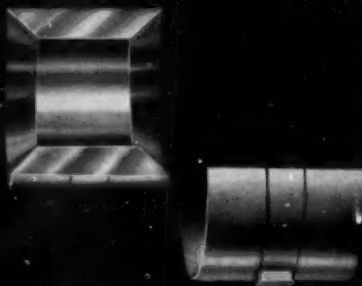
The Only MASTER COLLET  
With No Work Pressure  
on the Screw.



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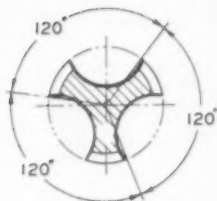
# BALANCED



# Action

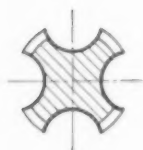
## ALL WINTER TAPS HAVE IT

### EXACT FLUTE SPACING



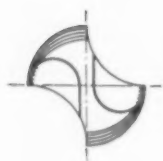
is the first fundamental of Balanced Action. It is accomplished by precision indexing.

### UNIFORMITY OF FLUTE CONTOURS



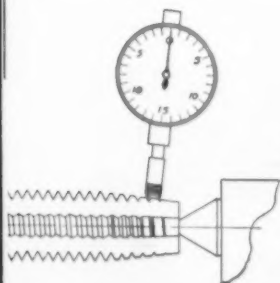
is essential, of course. You can't get Balanced Action without it.

### PRECISION CHIP DRIVER CONTOURS



are exact to size, shape, and position —formed to give optimum performance.

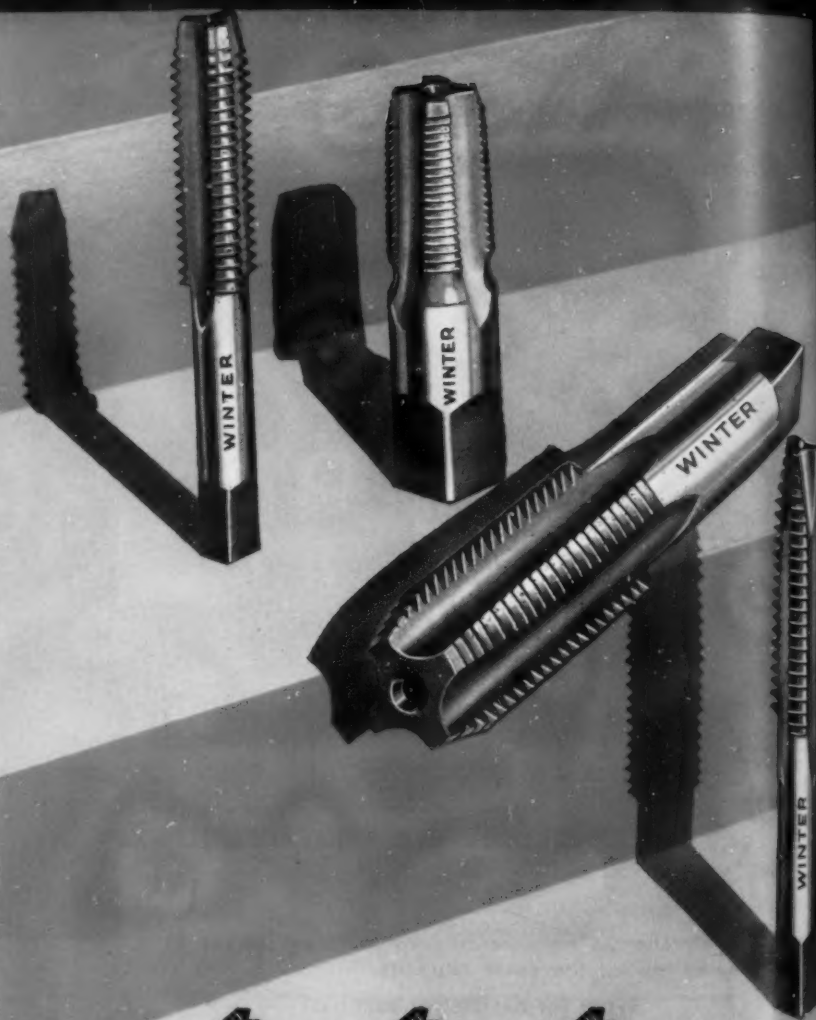
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By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy is assured.

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Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.



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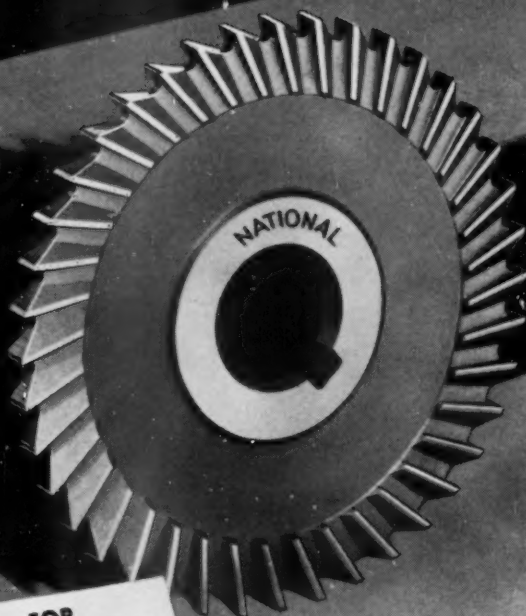




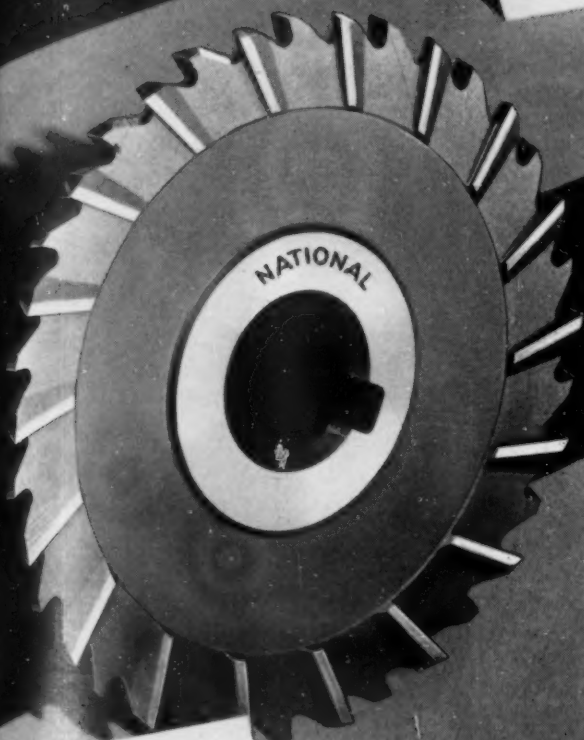
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NATIONAL METAL SLITTING SAWS—the choice of experienced tool users—are available in a wide range of stock sizes and widths. Many special types—also slotting cutters.

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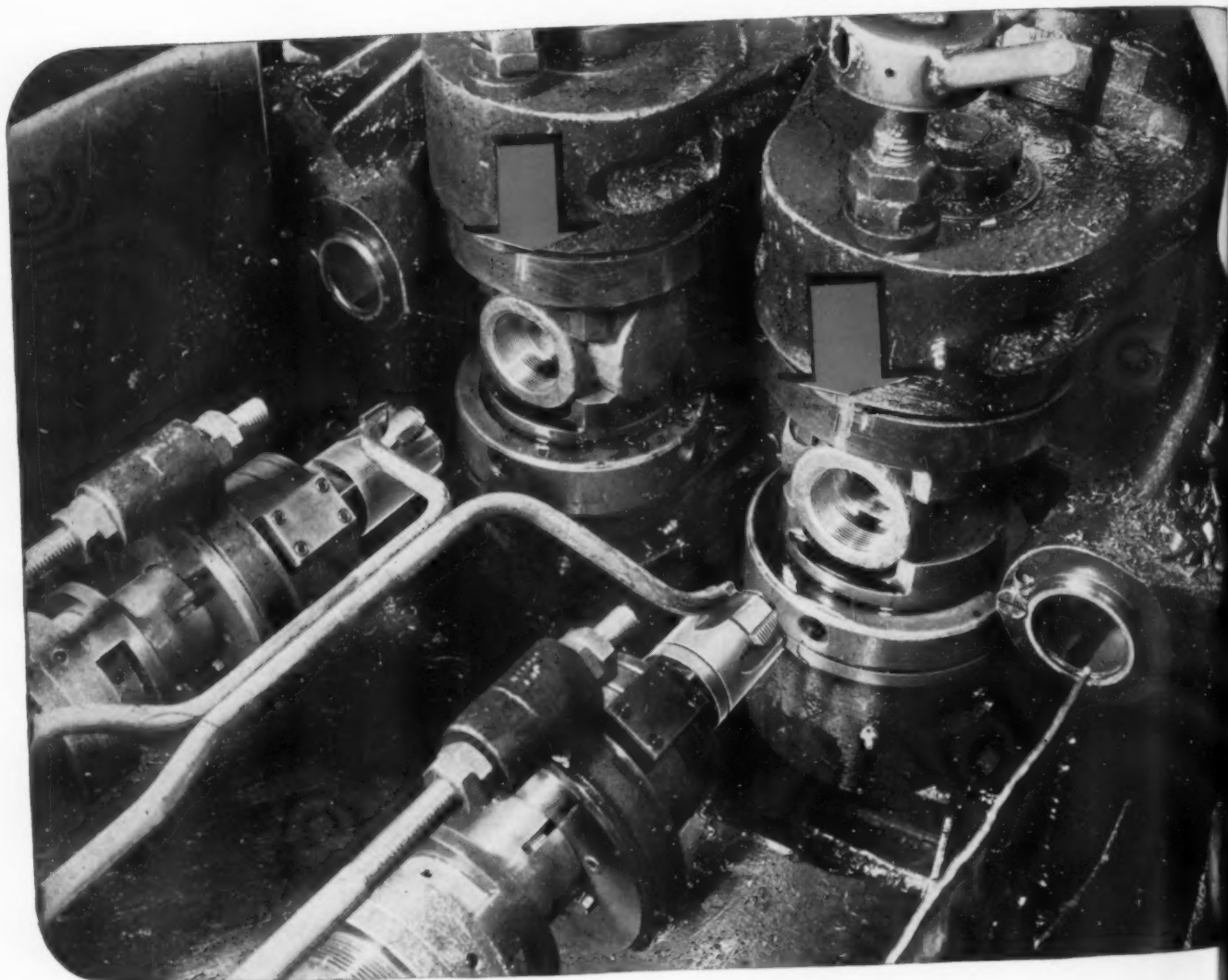
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**"CALL YOUR INDUSTRIAL  
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# LANDIS



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# TAP

## MASS-PRODUCES THREADS RATED FOR 6,000 POUNDS PRESSURE !!

↓ W-S forged steel pipe fittings guarantee the uninterrupted flow upon which the economy and safety of modern service and process piping lines depend. LANDIS Taps are regularly used by the Watson-Stillman Fittings Division, H. K. Porter Company, Inc., of Roselle, N. J., to cut the precision threads in these fittings required to withstand high pressures without leak.

In the illustrations, LANDIS LL Rotary Taps on a special drilling and tapping machine are threading W-S 2" 90° Pipe Elbows. 2" 11½ pitch ASTP threads are tapped in steel forgings at the rate of 35 surface feet per minute. Even at this speed 4000 threads are completed between chaser grinds, holding tool cost and downtime to a minimum.

LANDIS LL Taps are designed for the high-speed production of precision tapered threads. The taper of the threads is mechanically controlled by the receding action of the chasers.

Cutting strains are thereby reduced, thread accuracy and finish improved, and chaser life lengthened. The design of the ALM Head features unevenly spaced chasers which provide maximum rigidity and prevent chatter.

Detachable heads allow each size of Tap to produce a wide range of thread diameters. For example, the 2" LL Tap with different size heads will cut pipe threads from 1" to 2½". Both Rotary and Stationary models are built in sizes up to 13¾". For further information, send specifications and ask for Bulletin G-95.



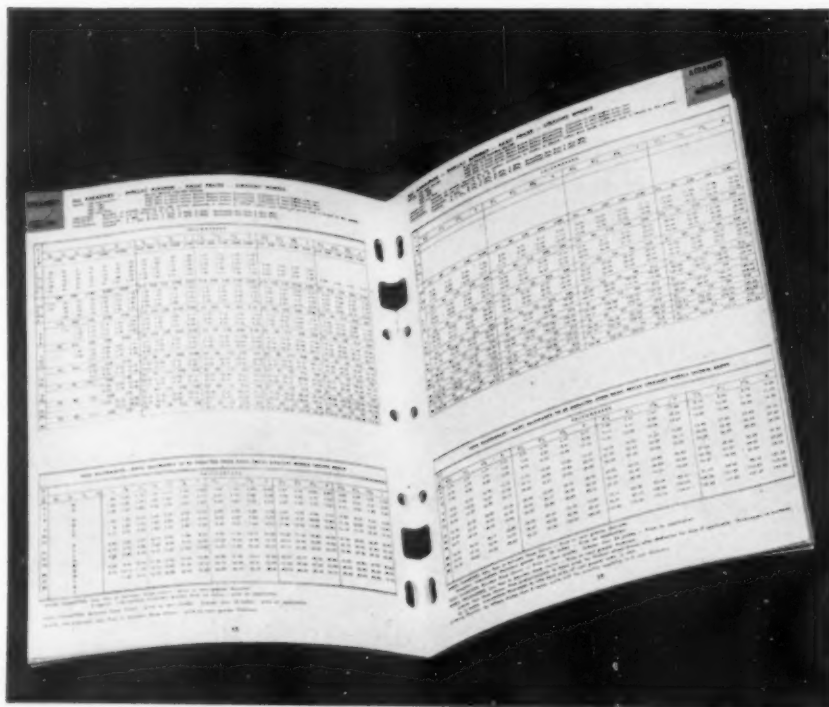
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PENNSYLVANIA**

GENERATING EQUIPMENT



# FIRST SIMPLIFIED PRICING IN GRINDING WHEEL HISTORY

**CARBORUNDUM's New "Quick-Finding" Reference  
Replaces Traditional Complex Time-Wasting System**



## 114 Page Pricing System Now Simplified to 32 Pages

CARBORUNDUM has achieved *simplification* with this new basic pricing system: previous information requiring 114 pages covering list prices, discounts, etc., has been reduced to only 32 pages.

You can now order your grinding wheels from CARBORUNDUM with a speed and accuracy hitherto impossible. Practically everything you want to know about prices, ordering quantities, discounts on any one wheel will be found on one page—arranged for quick, easy finding.

CARBORUNDUM® has taken the mystery out of buying industrial grinding wheels...by adopting the first really simplified basic price system in the history of the industry. Now you can determine prices, ordering quantities and discounts for a given wheel, almost without exception, by checking a single page of this new book.

You no longer have to refer to several pages to determine prices and discounts, nor follow complicated rules, nor apply chain discounts, nor worry about decimal multipliers. Even the special price additions covering various shapes have been eliminated. Basic prices are shown for all straight wheels and special wheels such as dishes, saucers, flaring cups, special faces, cones, plugs, and many others.

Practically all the wheels you use can be priced with a single discount under this new system, thus further simplifying your paper work and minimizing errors.

Coincidental with the adoption of this basic pricing system, some price adjustments have been made. Prices of certain lines of wheels are reduced, others are slightly higher.

# "A Boon to Every Customer and To Us," is Distributor Consensus

First copies of this new pricing system off the press went to several hundred Industrial Distributors of CARBORUNDUM's grinding wheel lines. The many letters of response have been highly enthusiastic. Here are typical comments:

"This is, without a doubt, the finest simplified pricing system I have ever seen. We want to compliment you on this progressive step."

"Heartiest congratulations—the new net pricing schedules are swell! It would do your heart good to see the gratitude with which these prices were received by the boys in our organization. I feel that you men

who devoted so much time to getting out this pricing structure should know how we feel. This is a real contribution to Industrial Distributors—and to industrial purchasing agents."

"Next to standardization of gradings, your new price book is probably the most progressive step that has been taken in simplifying the

marketing of abrasives. With this new basic pricing plan practically all the complications have been removed. We know it will have enthusiastic reception."

"Carborundum has taken a forward step that should pay off in the future. After trying a few examples in pricing, it looks as though price clerks and purchasing people will have a much easier time arriving at net prices than heretofore."

*The success of this new simplified pricing plan was foreordained, because twelve of the nation's top industrial supply men helped put the system together. This group, known as CARBORUNDUM's Distributor Advisory Board, was of material assistance to CARBORUNDUM's sales management on this key project.*

## HOW IT SAVES TIME...Cuts Errors

Reducing the number of pricing pages from 114 to 32 gives you only part of the picture of how CARBORUNDUM's new system speeds and simplifies the pricing of grinding wheels. It actually cuts down the number of steps required to compute a price—and best of all, it concentrates those steps within the confines of a single page.

As an example, consider the steps—and separate page references—previously required to find the price of cup wheels: 1) Look up the page showing the list price... 2) Look up the page showing list price additions... 3) Look up the page showing the standard ordering quantity schedule, to determine

quantity for discounting purposes... 4) Look up the page showing product discount... 5) Look up the page showing quantity discount.

All this information, previously appearing in five different places in the price schedule, is now found on a single ready-reference page. Nowonder pricing now takes far less time, with far fewer chances for error.

For when you have to flip pages back and forth, sometimes losing your place, often doing involved calculations, not only do you waste valuable time, but errors are bound to creep in—errors that are even more costly than the high cost of lost time. This new simplified "all-on-one-page" system was designed

to be error-proof; thorough tests by grinding wheel users prove that it actually promotes a high degree of accuracy—thus makes doubly valuable the savings in time it gives you.

### Simplified Pricing to be Extended to Other Abrasive Lines

The new basic pricing system will soon be applied to additional abrasive lines by CARBORUNDUM. Segments, Disc Wheels, Mounted Wheels and Points, "MX" Wheels, and other bonded products will shortly be covered by new simplified basic price lists.

## THE CARBORUNDUM COMPANY

REGISTERED TRADE MARK

**Your copy is  
waiting for you...**

**MAIL COUPON  
NOW...TODAY!**



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Niagara Falls, New York

Please send me my copy of "New Simplified Basic  
Prices of Grinding Wheels."

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COMPANY \_\_\_\_\_

STREET AND NUMBER \_\_\_\_\_

CITY \_\_\_\_\_

ZONE \_\_\_\_\_

STATE \_\_\_\_\_

81-317

NATCO 3-WAY TRUNNION MACHINE COMBINES

# Varied OPERATIONS

ON AUTOMOTIVE CAMSHAFTS

**NATCO  
ENGINEERED**  
for quality and  
quantity production



**RIGHT HAND UNIT DRILLING AND TAPPING**



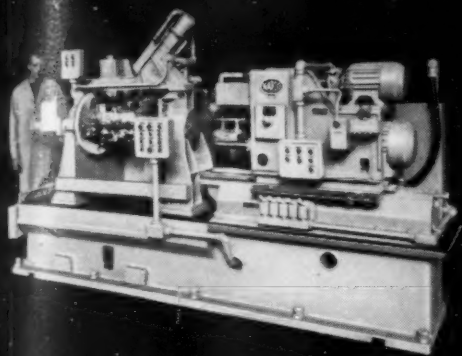
**VERTICAL  
ANGULAR UNIT  
DRILLING**



**REAR UNIT  
MILLING**

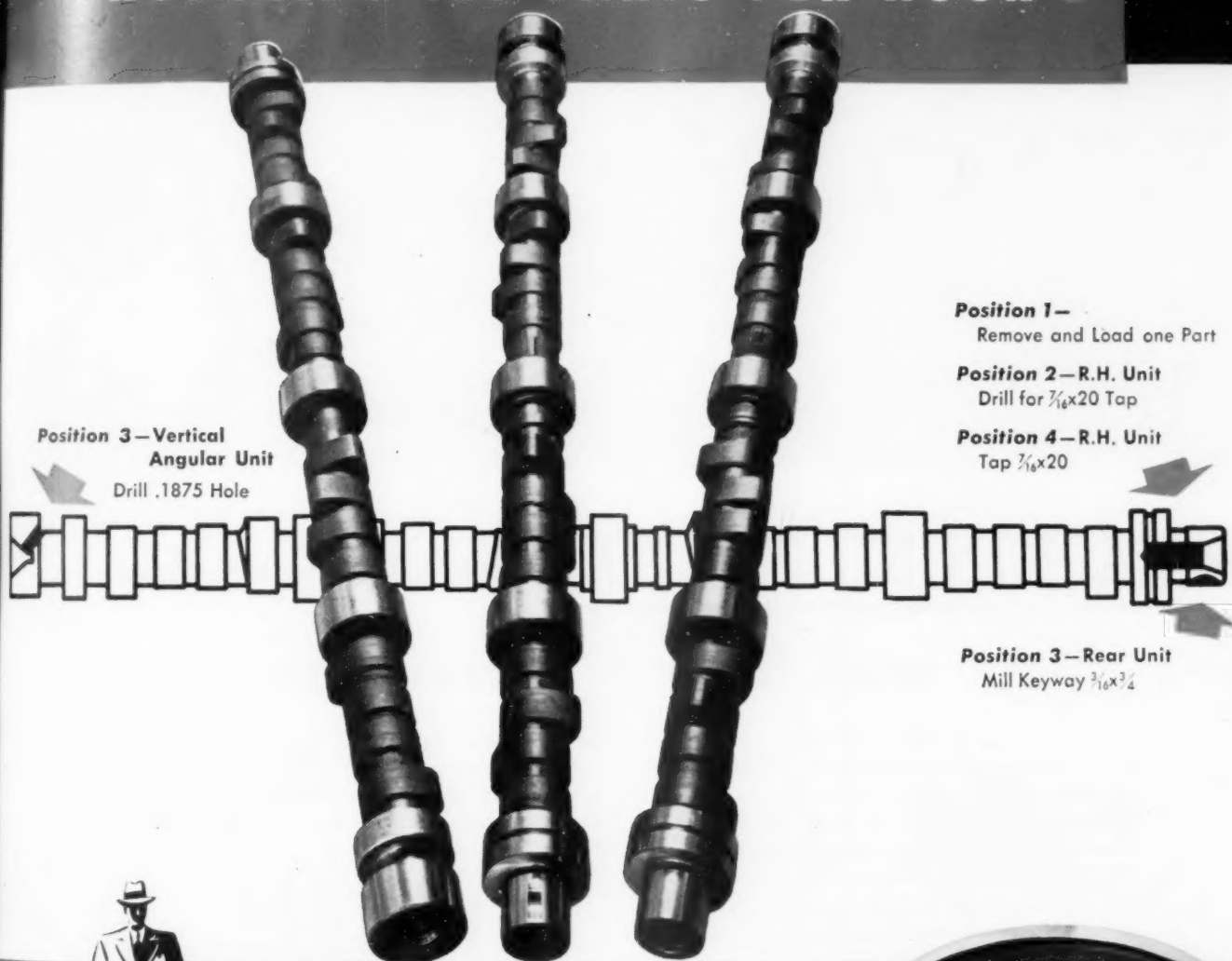






**NATCO 3-WAY**  
**Combination horizontal**  
**and vertical angular**  
**drilling, milling and**  
**tapping machine**

**PRODUCING 120 PARTS PER HOUR**



*Call a Natco Field Engineer*

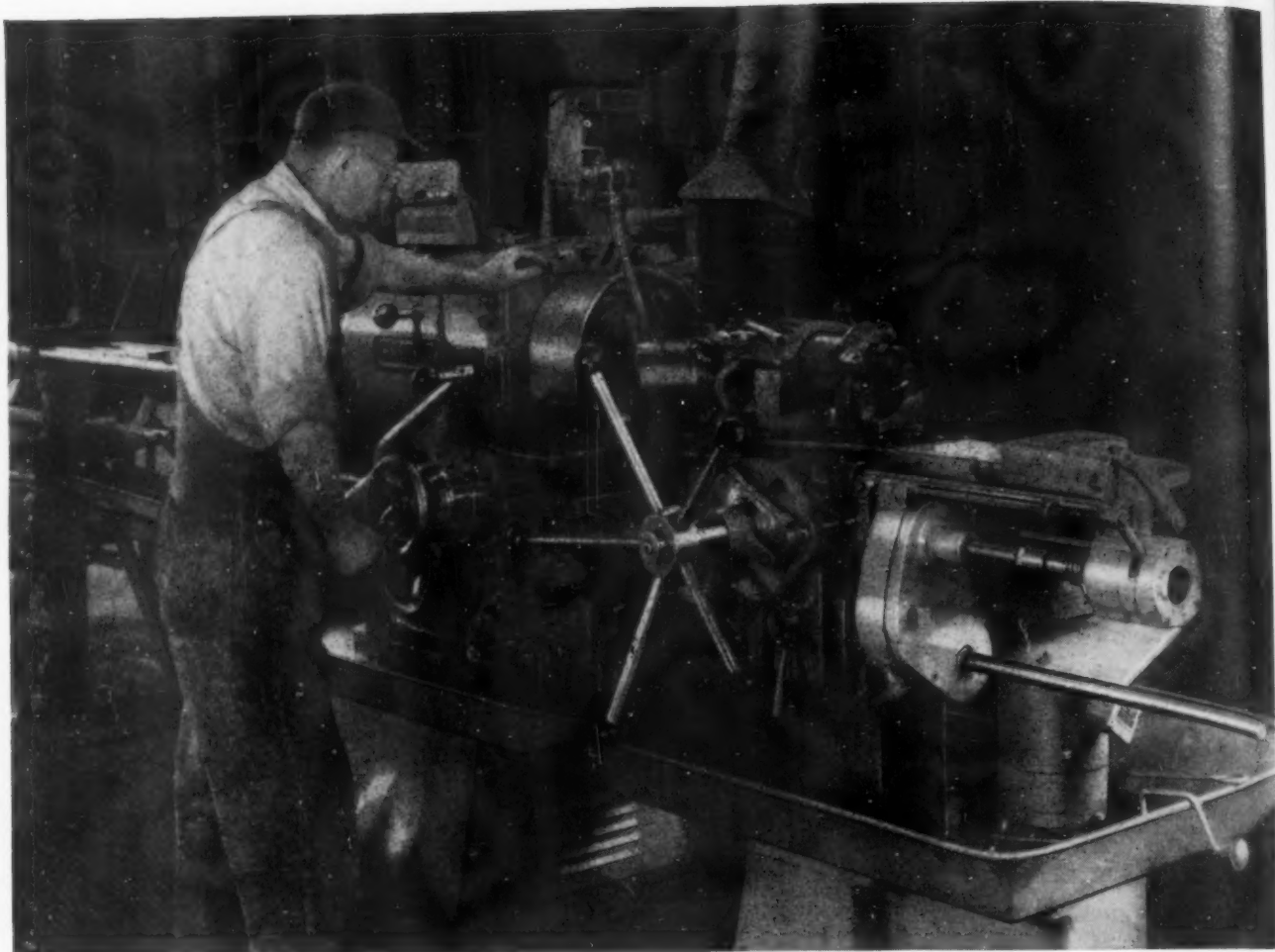
to help you solve your problems in  
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**NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana**

*Branch Offices*

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 1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY



## **MACHINING FOR GOLD** at Homestake



### **with Gisholt Turret Lathes**

Yes, gold mining means machinery. And here at the famous Homestake Mine at Lead, South Dakota, Gisholt Turret Lathes help to machine the machines that dig for gold. It's a big job, too—turning out the variety of rock bits and drill rods that are used up in large numbers.

This Gisholt Ram Type Lathe was first used to turn the plain ends on the one-inch quarter-octagon drill steel for two types of rock bits. Production averaged 30 an hour. Now, the machine is also used to machine and thread three sizes of forged steel drill rods. Besides all this, the Gisholt has the job of facing and chamfering the chuck, or shank ends, of the drill steel so that a perfectly flat face is hit by the drill machine tapet.

Here, again, Gisholt Ram Type Turret

Lathes prove their easy change-over and ability to produce profitably, even on small runs—big assets in any machine shop. Ask your nearest Gisholt representative about them. Or write us.

# **GISHOLT**

MACHINING COMPANY

Madison 10, Wisconsin

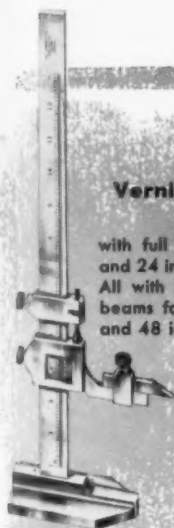


THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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These Starrett Tools help get machine tools into action quicker with unquestioned accuracy. Because they save time where time means big money, they pay for themselves over and over. They belong in every well equipped shop. Ask your Industrial Distributor about them.



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Vernier Height Gage  
No. 454**

with full 12 inch range — 18 and 24 inch sizes also available. All with hardened and ground beams for lasting legibility. 36 and 48 inch gages furnished on special order. NEW No. 354 — 6 inch Height Gage with slotted base also available.



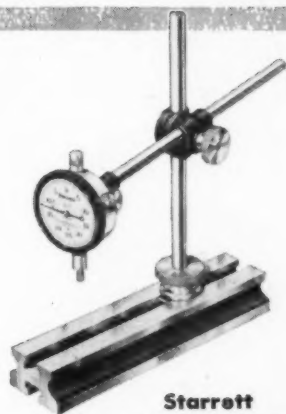
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Hardened Steel Square  
No. 20**

A precision square with hardened and accurately ground beam and blade edges. Many sizes from 1 1/2 to 36 inches.



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Universal Precision Gage  
No. 995 E (Patented)**

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**Starrett  
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Attachments permit infinite adjustment on countless machining and inspection set-ups. Graduated .0005", reads 0-25-0, range .125".



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A highly versatile test indicator for toolmakers, machinists, and set-up men. Available with holder on side or end of body.



**Starrett  
Surface Gages  
No. 257**

A universal gage for use on round work or flat surfaces. Available with 3" base and 9" or 12" spindle; also 3 3/4" base with 12" or 18" spindle.



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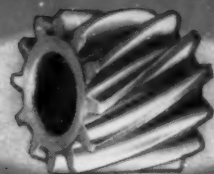


# GEARS SHAVED in 12 to 20 SECONDS

Finishing precision gears to close tolerances on tooth profile, index, eccentricity and tooth surface smoothness on Red Ring Shaving Machines is a high production operation as indicated by these random examples.



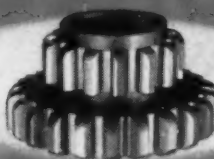
**A** SHAVING TIME 16 SECONDS



**D** SHAVING TIME 12 SECONDS



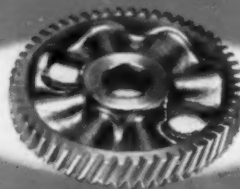
**B** SHAVING TIME 16 SECONDS



**E** SHAVING TIME 15 SECONDS



**C** SHAVING TIME 20 SECONDS



**F** SHAVING TIME 20 SECONDS

## GEAR CHARACTERISTICS

Gear	Stock Removed Over Pins	Material	No. of Teeth	PD	DP	Face Width
<b>A</b>	.010"	Steel	19	2.4"	9.25	5/8"
<b>B</b>	.010"	Steel	29	4.00	9.25	1 1/8"
<b>C</b>	.010"	Cast Iron	28	2 3/4"	10	1 1/4"
<b>D</b>	.005"	Steel	12	1 1/8"	13.5	1"
<b>E</b>	.006"	Steel	14	2 3/8"	6/8	1 1/4"
<b>F</b>	.012"	Aluminum	54	5 3/8"	10	3/4"

WRITE FOR DESCRIPTIVE  
LITERATURE ON  
*Red Ring  
Gear Shaving*

SPUR AND HELICAL  
GEAR SPECIALISTS  
ORIGINATORS OF ROTARY SHAVING  
AND ELLIPTOID TOOTH FORM

**NATIONAL BROACH & MACHINE CO.**

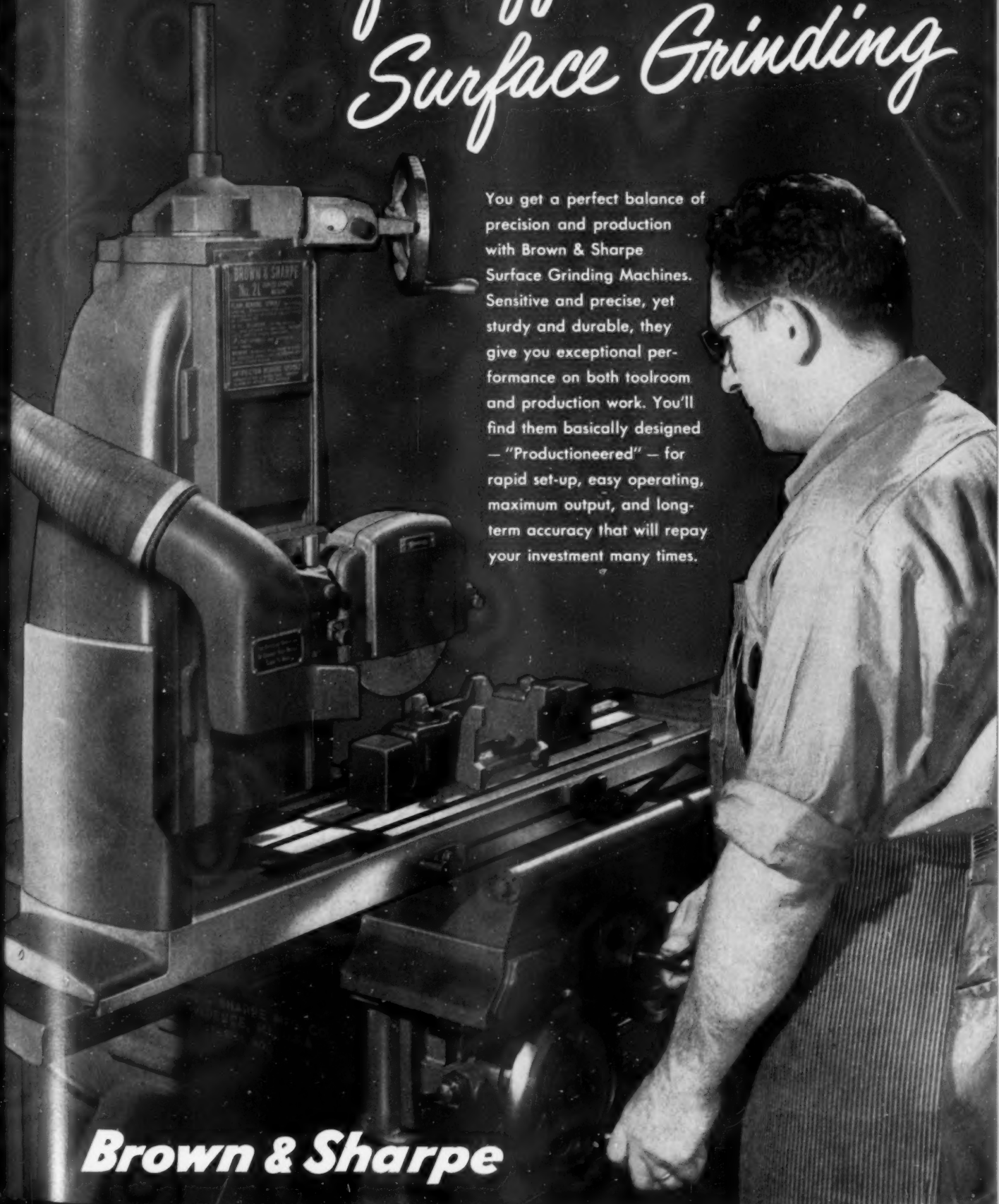
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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

# PRODUCTIONEERED

## *for Efficient Surface Grinding*

You get a perfect balance of precision and production with Brown & Sharpe Surface Grinding Machines. Sensitive and precise, yet sturdy and durable, they give you exceptional performance on both toolroom and production work. You'll find them basically designed — "Productioneered" — for rapid set-up, easy operating, maximum output, and long-term accuracy that will repay your investment many times.



**Brown & Sharpe**



# "Productioneered" to cut



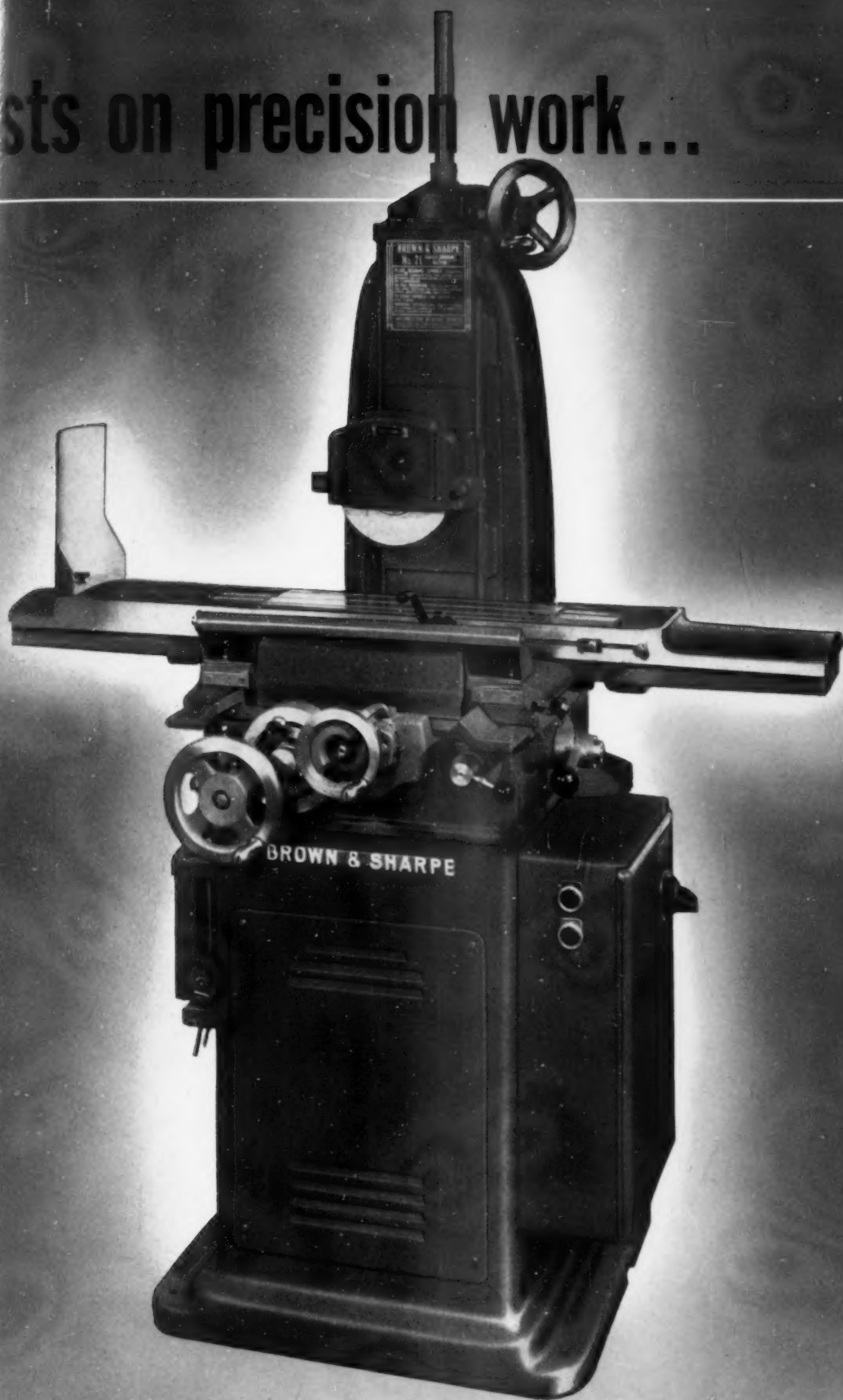
## **Brown & Sharpe** No. 5 SURFACE GRINDING MACHINE

Where precision, fine finish, and rapid stock removal on flat surfaces are equally important, this productive hydraulic-type machine quickly pays for itself. Automatic hydraulic table feeds are powerful, smooth, quiet and infinitely variable. Centrally-located controls permit rapid set-up and easy operation. Flange-mounted remov-

able unit-type wheel spindle provides accuracy of alignment — choice of plain-bearing or antifriction-bearing types. You'll find many other features for speed, safety, accuracy and long life that make the No. 5 ideal on both toolroom and production grinding for work up to 24" long, 8" wide and 11" high.



costs on precision work...



**Brown & Sharpe** NOS. 2L and 2LB SURFACE GRINDING MACHINES

These machines, long famous for their economical production of small to medium-sized precision work, give you the advantages of automatic lubrication and ample guarding to reduce maintenance costs and extend machine life. Removable unit-type precision wheel spin-

— and rigid column construction—provide exceptional grinding finish with quick spark-out. The No. 2LB Machine with Hand Feeds Only is ideal for toolroom and production work where automatic feeds are not used. No. 2L (illustrated) and No. 2LB grind work to 18" long, 6" wide and 9½" high, using a wheel 7" in diameter.



# "Productioneered" to aid in uniformly accurate production from your machines



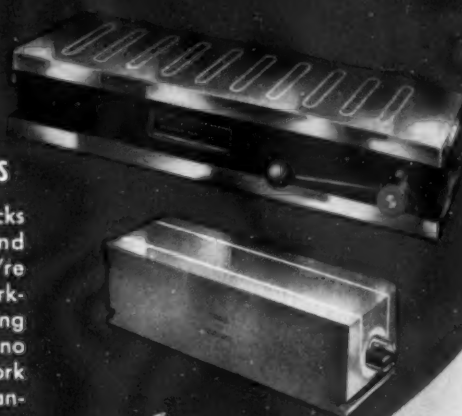
## BROWN & SHARPE ELECTRONIC MEASURING EQUIPMENT

Precision gaging and inspection as close as .00001" are simple and fast with this equipment that practically eliminates human error — for external or internal measuring.

## BROWN & SHARPE PERMANENT MAGNET CHUCKS

These Permanent Magnet Chucks eliminate clamps, vises, and fixtures on many jobs . . . they're the time-saving way to solve work-holding problems. No operating costs, no electrical connections, no heating. Just turn lever and work is held firmly. Rotary and rectangular models. Wide range of sizes.

For sale only in the United States of America and its Territories.



## BROWN & SHARPE No. 616 CYLINDRICAL GRINDING AND INDEXING ATTACHMENT

This versatile attachment makes possible dry grinding of small cylindrical work on surface grinders. Accommodates tapers and work requiring indexing. Grinding is done on dead centers. Indexing spring chuck, with spring collets, holds work not ground between centers. Centers swing 6" diameter — take 5 1/4" length. Table tilts to 45°.

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Milling Machines • Grinding Machines • Screw Machines • Cut Machine Tool Accessories • Machinist Tools • Johanson Cage Drills • Electronic Measuring Equipment • Permanent Magnet Chucks • Pul-

Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

machine life. Removable unit-type precision wheel spin-  
 ing, plain-bearing or antifriction-bearing — and rigid col-

2LB grind work to 18" long, 8" wide and 7 1/2" high, using  
 a wheel 7" in diameter.



**wherever you are...**

**it's still the same**

Rex® High Speed Steels  
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SPECIFY  
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**CRUCIBLE**

first name in special purpose steels

53 years of *Fine* steelmaking

**TOOL STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

July, 1953

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21

And that goes for Crucible's REX High Speed Steels, too. For all of REX High Speed Steels are subjected to extensive metallurgical tests — microscopic examinations, chemical analysis, ultra-sonic checks both in the billet and finished form, magnetic analysis, and strength tests — to assure you of uniform quality regardless of when or where you buy them.

This *uniformity factor* distinguishes Crucible's REX High Speed Steels from other brands. Next time you order high speed steel, be sure you consider this all-important factor. When you do, we're sure you'll specify the Crucible REX brand.

WRITE TODAY for the unique Crucible Tool Steel Selector, 9" diameter, in 3 colors — a twist of the dial tells you which tool steel is best for your application. Address your request to Crucible Steel Company of America, Dept. T, Oliver Building, Pittsburgh 22, Pa.







## Carbides dictate the conditions

All accepted cutting tool materials have the common characteristic of specifying the conditions under which they will perform at maximum efficiency. And if the results are sufficiently promising the conditions will eventually be met.

ONE HUNDRED PERCENT carbide application on a multiple spindle bar automatic makes specific demands on both machine and personnel for successful use. The part illustrated is from regular production on comparative runs, in a plant where the conditions were met.

The Conomatic Carbide Development program can be of possible service to you in determining the suitability of your work, or any part of it, to 100% carbide tooling. Just ask your Cone Representative for details, or inquire direct.



MATERIAL — BRASS: Pickoff attachment in 6th position permits machining piece complete.

	HSS	CARBIDE
Cycle Time	12 secs.	6 secs.
Work Spindle Speed	1125 R.P.M. at 331 S.F.	1528 R.P.M. at 450 S.F.
Tool Wear	50,000 pcs. per grind	unlimited number of pieces per grind

# Conomatic }

CONE AUTOMATIC  
MACHINE COMPANY, INC.  
WINDSOR, VT., U.S.A.

Series

WESSON'S

*New*

WRITE FOR  
BULLETIN  
No. 521

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FAST POSITIVE  
LOCKING SCREW  
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STEEL FINGER  
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CARBIDE TIP  
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SCREW  
(STANDARD)

FINE ADJUSTMENT  
SCREW

- Use heavier feeds.
- Use higher speeds.
- Cut grinding cost.
- Eliminate shank grinding.
- Eliminate brazing of tips.
- Cut replacement costs.
- For heavy duty and extra heavy duty jobs.
- Tested and proven on production lines throughout industry.



**GUARANTEED INDESTRUCTIBLE  
IN ORDINARY USE**

**THREE STANDARD TYPES**

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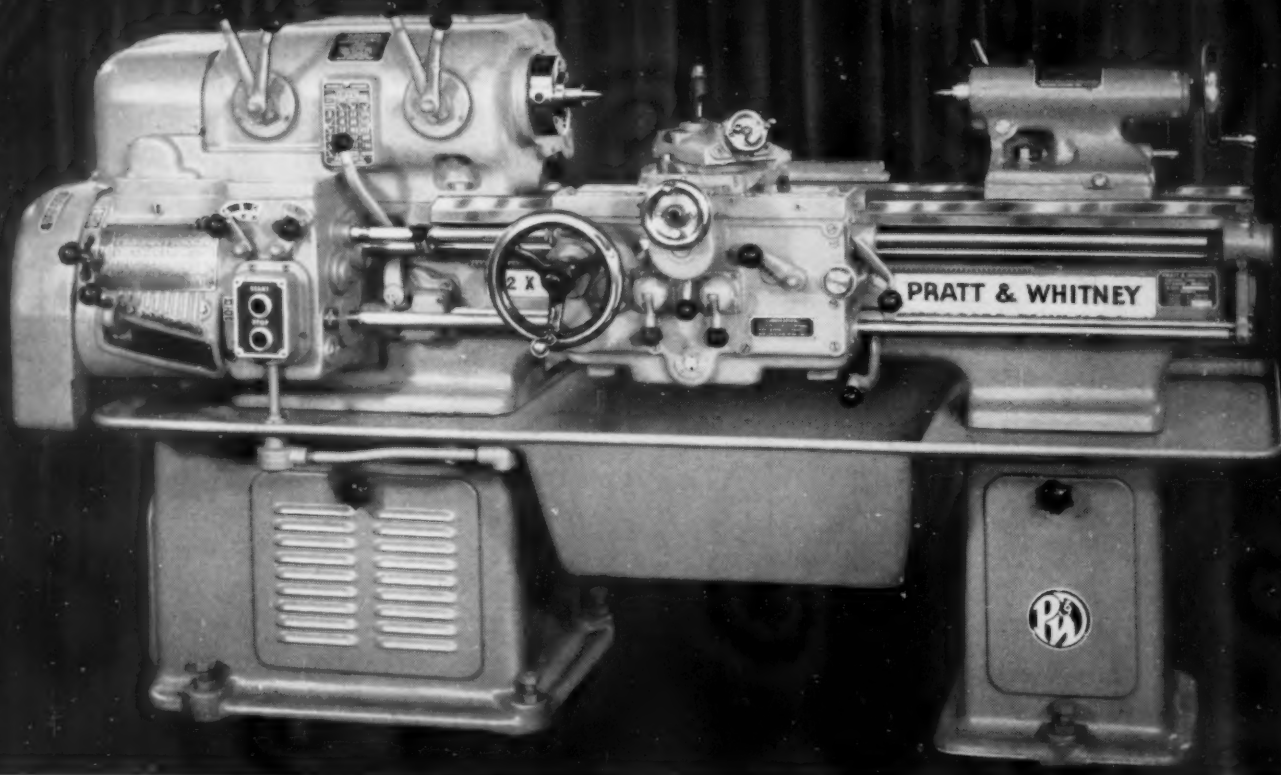
When "Almost as Good" ... ISN'T GOOD ENOUGH!

*You turn to*

**PRATT & WHITNEY**

**MODEL "C"**

*Lathes*



*"The Standard by which all Fine Lathes are Judged"*

Rapid scientific progress has created vitally needed new weapons for defense and valuable new products for civilian use. Matching science's progress, industry has developed these designs into tangible realities . . . and this has required working to closer tolerances than ever before. Countless tool rooms must maintain daily standards of accuracy unheard of only a few years ago.

Manufacturers faced with the problem of working to these new, higher standards of accuracy, can't afford to use "almost as good" equipment. It's time to invest in a Pratt & Whitney Model "C" Lathe . . . your assurance of precision work produced dependably and consistently.

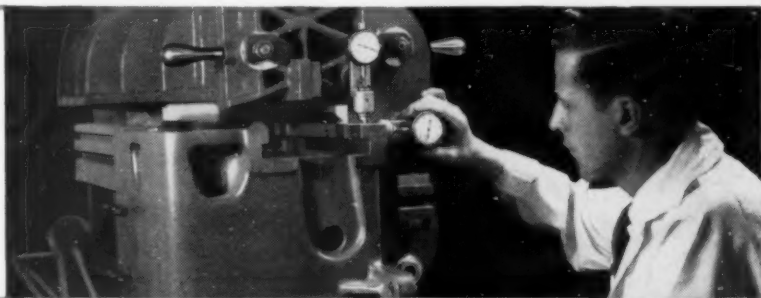


# *The Finest Example of All that Pratt & Whitney stands for*

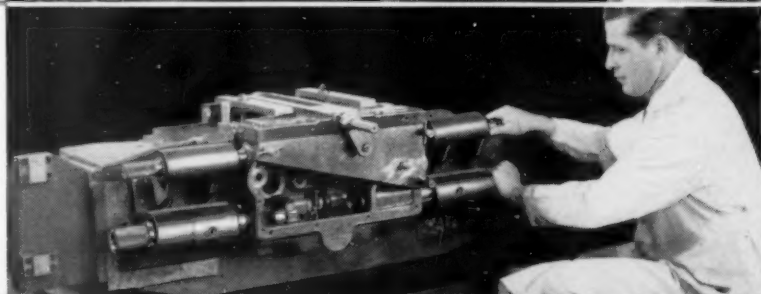
The tool room is the heart of accuracy in every plant . . . and the lathe is the heart of every tool room. For this reason, we at Pratt & Whitney have devoted to the Model "C" every detail of advanced design, quality material and skilled workmanship that make this the finest lathe available anywhere at any price.

The operations shown below — just a few of the many developed to assure precision of assembly — are examples of the painstaking, skillful care that assures high final accuracy.

Here a Pratt & Whitney Inspector is using a specially designed fixture to check the accuracy of the ground bearing surfaces on the bed which locate the headstock and the gearbox. To assure accurate alignments, these locating points are held to extremely close limits.



Precision practice controls every step in the manufacture of P&W Model "C" Lathes. This precision fixture holds the carriage and apron castings in perfect alignment while they are pinned and fastened together.



Before the hardened and ground bed ways are accepted they must pass rigid inspections for hardness, parallelism of carriage and tailstock ways, flatness, V formation, finish and dimension. Here a carriage way is being tested. Total end-to-end error must not exceed .0002" with the straightedge in several positions.



## *For Complete Information*

. . . send for your copy of Circular No. 539 that describes all the advanced features of the Pratt & Whitney Model "C" lathe. See how a Model "C" will help you establish and maintain new standards of accuracy in your tool room. Write on your Company letterhead to the Pratt & Whitney Branch Office nearest you, or direct to West Hartford.

12" and 16" SIZES IN  
SEVERAL BED LENGTHS

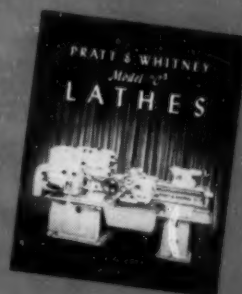
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DIVISION NILES-BEMENT-POND COMPANY

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Prevent Scratch-Damage,  
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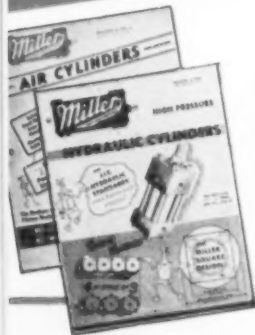
## SOLID STEEL HEADS, CAPS and MOUNTINGS

Eliminate Breakage

## DIRT WIPER SEALS

Protect Rods, Seals, Bushings

Standard Leather Cup Seal As-  
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able With Miller Standard Piston  
Ring Piston Assembly



WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

**MET J. I. C. HYDRAULIC  
STANDARDS** years before  
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**SPACE-SAVING SQUARE  
DESIGN** originated by Miller in  
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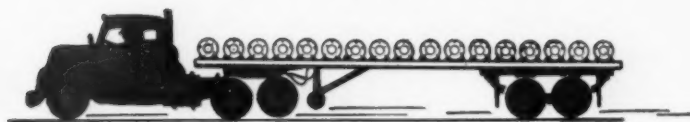


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AIR & HYDRAULIC CYLINDERS • BOOSTERS • COUNTERBALANCE CYLINDERS

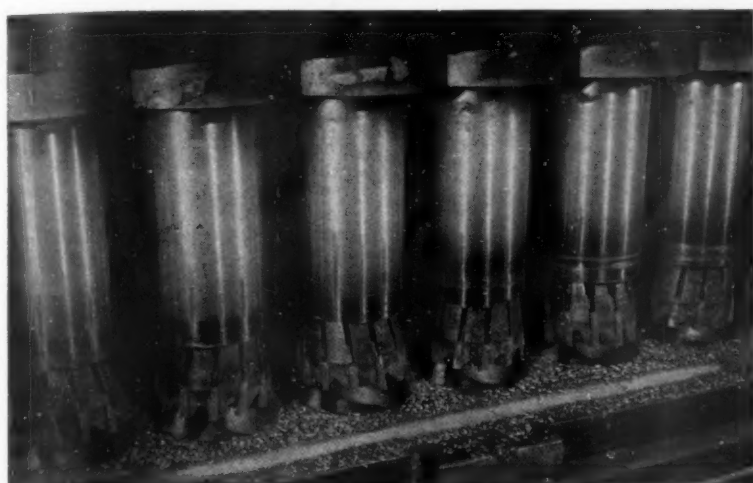
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OF



**WESSONMETAL**

CEMENTED CARBIDE!

**TONS OF PRODUCTION!**



**ACTUAL JOB**

**Farm Implement Mfg. Co.**

Machine.....Ingersoll Boring Mill—6 spindle  
Part.....Cylinder block  
Operation.....Rough cylinder bore  
Tools.....3 R.H. and 3 L.H. Wesson Fine  
Pitch Cutters—3.480 dia.—  
12 Wessonmetal Solid GI Blades  
Speed.....148 S.F.M.  
Stock Removal...3/16"  
Feed.....10" per min.—.063 per revolution  
Length of Cut...8 7/8"

**OVER 300% DOLLAR SAVINGS PER TOOL**

**OLD METHOD**

Pieces per Grind.....836  
Cost of Tool.....\$49.68  
Grinding Cost  
per sharpening.....\$11.70  
Tool Cost per 100 Pieces..\$2.588

**NEW WESSON METHOD**

Pieces per Grind.....3160  
Cost of Tool.....\$172.80  
Grinding Cost  
per Sharpening.....\$8.78  
Tool Cost per 100 Pieces..\$0.642

On only one machine with Wesson Tools Savings of over \$900 per year

**HOW IS YOUR PRODUCTION SCORE CARD!**



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on Wesson's  
educational, full color,  
sound movie—  
"This Carbide Age."

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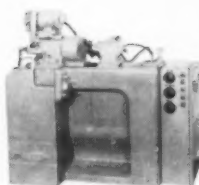
# bryant

## internal grinding



**no. 1309-W**

Finishes 2 bores and a taper straight and concentric. 2 wheelheads are used on this semi-automatic. Max. traverse stroke, 6". Max. grinding length, 3½".



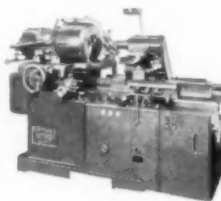
**no. 1109**

For high production of small bores where accuracy of size and finish are required. Max. traverse stroke, 6". Max. grinding length, 3½".



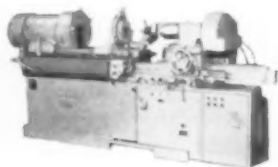
**no. 2209**

For precision and high production grinding of ball bearing races, gears, rolls, bushings, etc. Max. traverse stroke, 6". Max. grinding length, ¾".



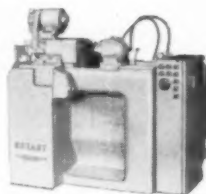
**no. 1116**

A general purpose hole grinder for tool room, small shop, or general production. Maximum traverse stroke, 20". Maximum grinding length, 8".



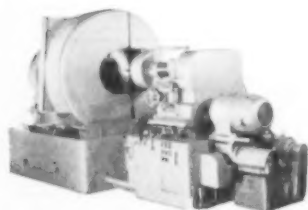
**no. 1416**

Specially designed for grinding bores in long work, such as machine tool spindles. Maximum traverse stroke, 20". Maximum grinding length, 8".



**no. 1209**

A fully automatic, high production machine for small and medium bore grinding. Max. traverse stroke, 6". Max. grinding length, 3".

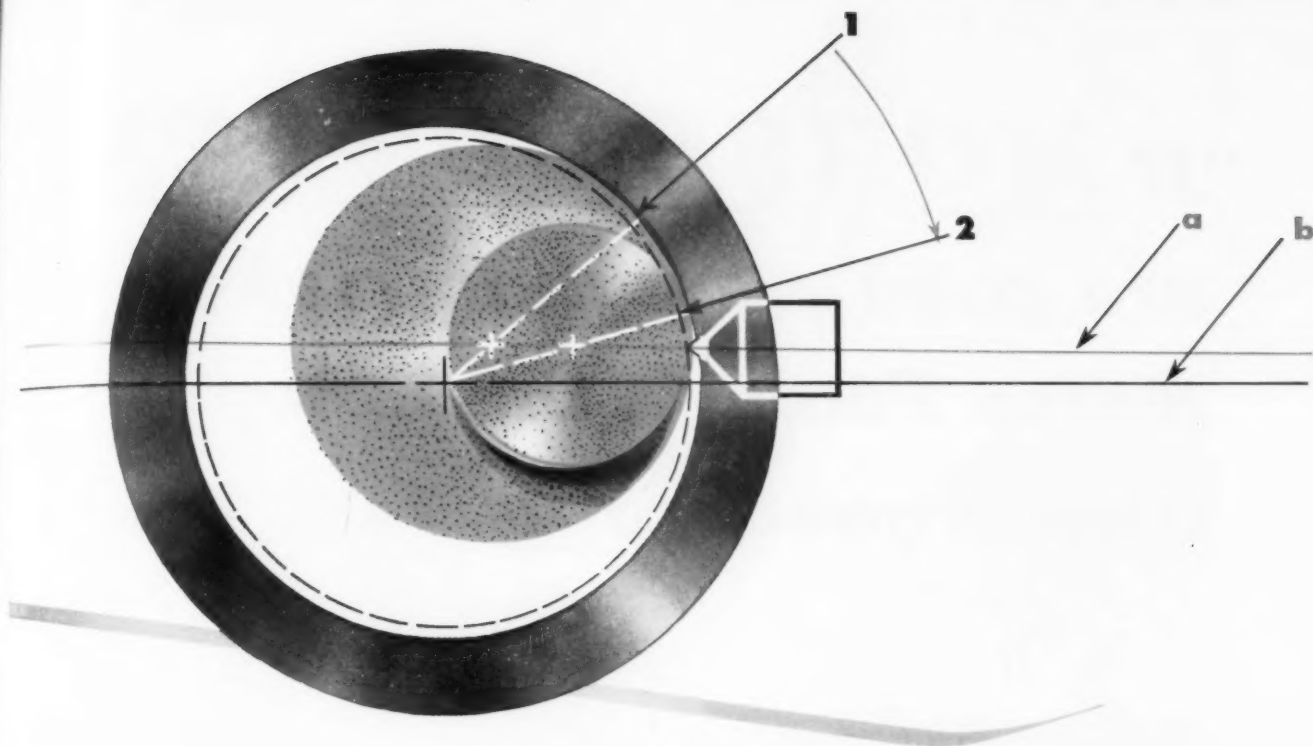


**no. 1460**

For production or single piece hole grinding on parts up to 60" diameter. Max. traverse stroke, 21". Max. grinding length, 16".



Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.



**I**F the internal grinder is to generate straight holes within precision tolerances, on a production basis, the various elements of the machine must be properly aligned. The axis of the work, the axis of the wheel, and the diamond must be in a plane parallel with both traverse and cross feed ways. Then the direction of feed will coincide with the line from the center of the workpiece to the point of contact between the wheel and the work, and the wheel will be dressed in line with its point of contact with the work regardless of the size of the wheel.

In the illustration above, these requirements are not met because the work center "b" is below plane "a" established by the wheel axis and the diamond. The drawing shows the wheel at its largest diameter (new) and also at its smallest diameter (worn). The difference between center heights "a" and "b" is constant during the life of the wheel. The position of the diamond remains constant for the life of the wheel. When the large wheel is dressed by the diamond it will contact the work at a point established by a line from the center of the work through the center of the wheel (position 1). When diamond sizing, the work, or wheel, is fed to a predetermined position. As the wheel wears down, it will continue to contact the diamond at the same point during dressing, but the small wheel will contact the work at position 2 and the size of the finished hole will be substantially smaller.

As the wheel wears, the point of contact between wheel and work will move gradually from position 1 down to position 2, and the size of the finished hole will become progressively smaller. This is one of the reasons that some internal grinders, when set up for diamond sizing, will not hold size during the life of the wheel. Many operators attempt to compensate for this error by constantly adjusting the diamond. The correct remedy would be to bring the axis of the work, the axis of the wheel and the diamond all into a common plane parallel with both traverse and cross feed ways. Finish size will then be correct regardless of wheel diameter.

**Bryant Chucking Grinder Company**  
Springfield, Vermont, U. S. A.

*Internal grinders • Internal & External thread gages*

***"If MORSE CUTTERS***

***are good enough to make  
Morse Tools . . . then they're  
plenty good for us, too!"***







*That's right* — Morse Milling Cutters are used every day in the Morse plant — to make all Morse Cutting Tools the finest precision made tools in the market.

Morse knows from years of closely checked experience, that these Cutters impart longer life, smoother cutting action, and higher return per sharpening than any other cutters. And when you "thrive on your own cooking," then that's proof that the cooking is tops!

Besides the cutters shown here, your Morse-Franchised Distributor can supply you with Angle, Concave or Convex Cutters, Woodruff Keyseat and Involute Gear Cutters, and others. He's your right-hand man for cutting costs — so see him today about the Morse Milling Cutters you need in *your* operation.

**MORSE TWIST DRILL & MACHINE COMPANY**  
NEW BEDFORD, MASSACHUSETTS

(Division of VAN NORMAN CO.)

Warehouses in New York, Chicago, Detroit, Houston, San Francisco

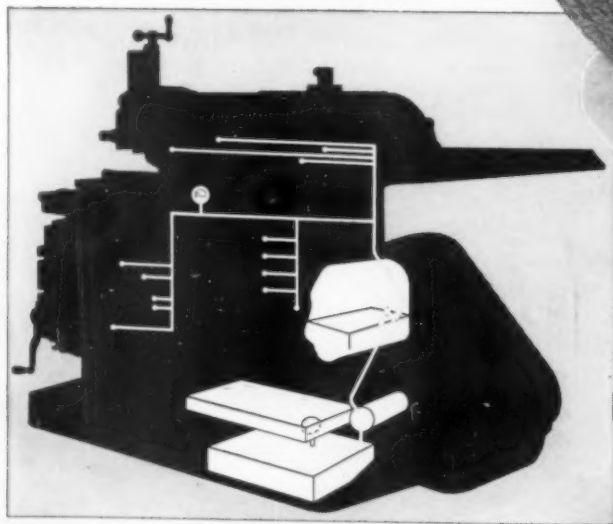
# MORSE

## Cutting Tools

*Buy them by phone  
from your Morse-Franchised  
Distributor and save  
ordering time*

# 50 lbs. oil pressure

**IS NECESSARY WITH  
A CUT LIKE THIS...**



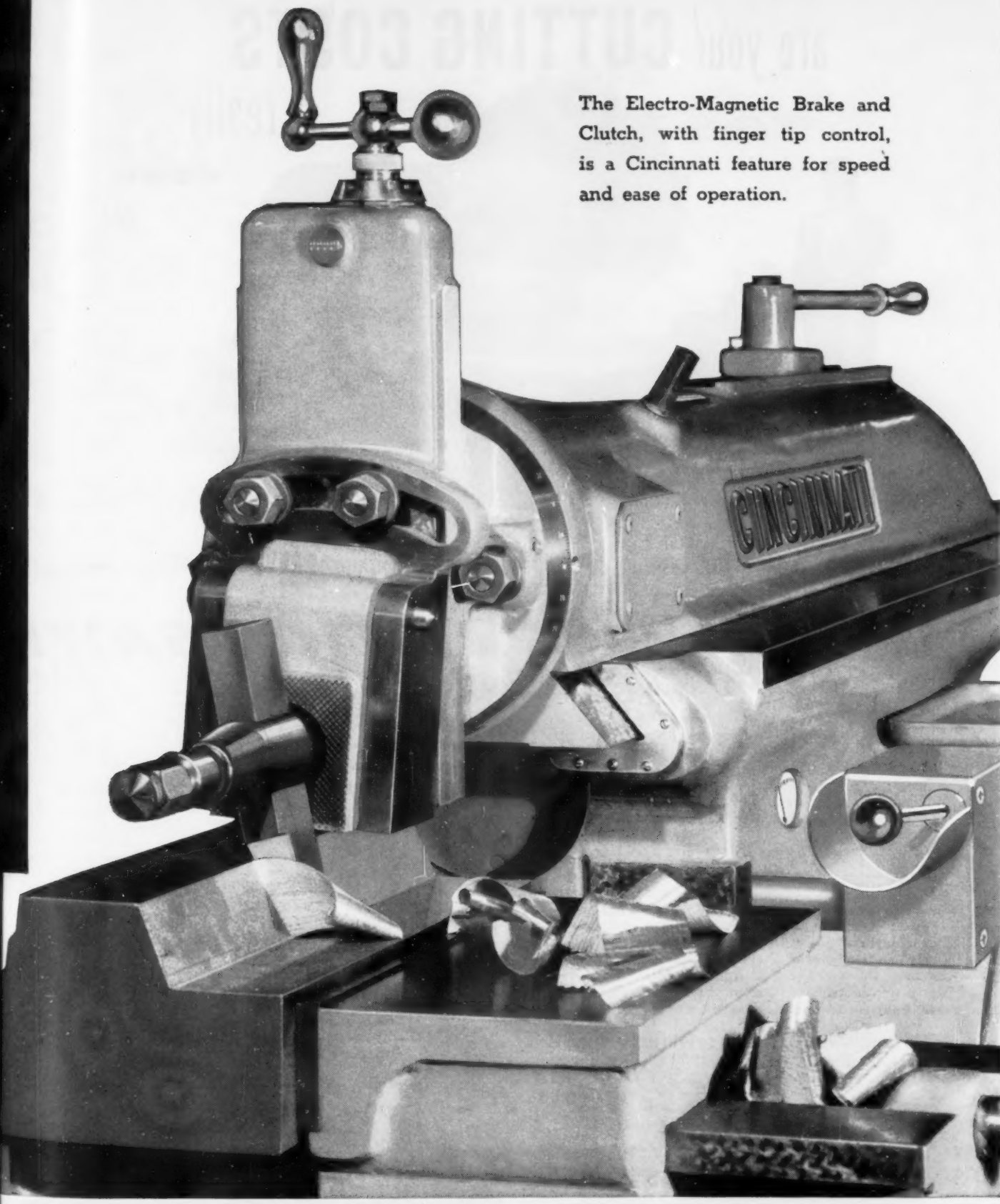
50 p.s.i. system includes 50 micro filter, settling basin and reservoir. Transmission runs submerged in oil.

**This tremendous cut** demonstrates the extra strength, rigidity, and power in Cincinnati Shapers. It also demonstrates the ability of the 50 p.s.i. lubrication system to develop and maintain oil films under the heaviest loads.

Write for Catalog N-5.



Demonstration cut.  
Actual size steel chip, 2" cut .030" feed  
Cincinnati 24" H.D. Shaper.



The Electro-Magnetic Brake and Clutch, with finger tip control, is a Cincinnati feature for speed and ease of operation.

**THE CINCINNATI SHAPER CO.**

CINCINNATI 25, OHIO, U.S.A.

SHAPERS • SHEARS • BRAKES





are your **CUTTING COSTS**

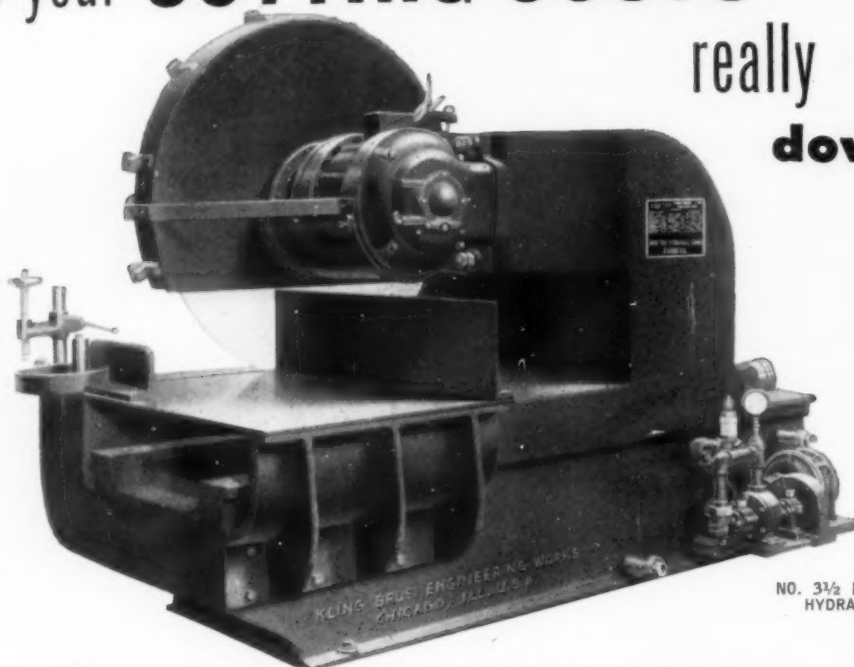
really

down

far

enough

?



NO. 3½ FRICTION SAW  
HYDRAULIC FEED

you'll never know for certain until you **COMPARE** your **PRESENT** cutting speed with

the faster **Kling** HIGH SPEED **FRICTION SAW!**

#### What is friction sawing?

It's a proven method of cutting metal by generating heat through friction on the part to be cut at a rate faster than that part can absorb heat. This temperature increase reduces the tensile strength of the piece to the point that the weakened surface can no longer resist the action of the colder blade. The metal is thus easily removed with no apparent wear on the blade surface.

#### Fastest, all-around cut-off machine in the shop!










Cuts all types of steel, hard or soft, big or small, in any shape, without distortion. For day-in, day-out production, one Kling Friction Saw will do the volume of work that would ordinarily require several separate shears or slow speed saws. One of the big time-saving reasons is the ability of the Kling Friction Saw to cut any structural shape, without change of blade or setup. Because the average Friction Saw blade will give a good full day's production before requiring redressing, you eliminate costly downtime and also save on tool costs.

#### FREE complete, friction sawing information!

Learn how you can profitably apply Kling Friction Sawing in your plant. The information contained in this 12-page bulletin will give you the complete story on Friction Sawing... including the principles of the process and some of its applications. Write today for your **FREE** copy.



**KLING BROS. ENGINEERING WORKS**  
1321 N. Kostner Ave. • Chicago 51, Illinois

How long would it take you to cut these pieces?	With a Kling friction saw you could do it in approximately...
24" 100 lb. I Beam 	<b>28 seconds</b>
15" 55 lb. Channel 	<b>15 seconds</b>
8"x8"x34.3 lb. H Beam 	<b>10 seconds</b>
100 lb. A.R.A. Rail 	<b>9 seconds</b>
6-1/2"x6-1/2"x19.8 lb. Tee 	<b>5 seconds</b>
8"x8"x3/4" Angle 	<b>11 seconds</b>
3" Square 	<b>10 seconds</b>
4" Round 	<b>15 seconds</b>
6" O.D. Tube, 1/2" Wall 	<b>11 seconds</b>

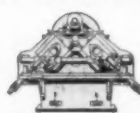
\*What's your requirement? There's a size to fit your specific needs—large or small

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Double Angle Shears



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Punches

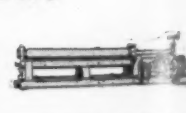


Plate Bending Roller

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# The Tool Engineer

## To Know Ourselves Better

Among the many organizations of engineers, ASTE is one of the largest in total membership. We are definitely the youngest of the larger and more important organizations of engineers.

Further, we are unique in that while maintaining relatively strict membership qualification requirements we do not necessarily restrict ourselves to the graduate engineer.

While we have a large number of engineering graduates—and this number is increasing steadily—we must emphasize that ASTE membership is a year-to-year extension course in manufacturing methods for all engineers having a genuine interest in tooling.

At the last meeting of your Board of Directors, a research into just what makes a tool engineer was ordered. While this study will take years to complete we expect this knowledge will assist each of our members as an individual, helping him to become a better tool engineer. Also it will be invaluable to industry in selection, evaluation and promotion of its tool engineers.

In this day of material technical development, social aspects are often disregarded. Yours is a Society—an organization of people and for people. We owe it to ourselves, to industry and to our country to learn more about ourselves. You will hear more about our "Personnel Research Study of the Tool Engineer."

*R. F. Waindle*

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# TRANSLATING A PRODUCT from Design into Production\*

**By Robert L. McWilliams**

Educational Relations Section

General Motors Corp.

Detroit, Mich.

**T**HE DESIGN OF a part is a creative function and as such cannot be constricted by procedures. The designer must rely upon his own knowledge and imagineering, although seeking advice and consultation of others in the development of his design to the over-all specifications established by management. Therefore, this paper will present a procedure and standards to facilitate and control the movement of a design from drawing board into production.

It is imperative that procedures and standards should be placed in their proper perspective. In any organization or undertaking, the teamwork of its people is the greatest single factor which spells success or failure. Without cooperation, the best procedure in the world would be worthless. Fig. 1 gives some idea of how many groups of people can be concerned with the production of a product. With regard to a planned product, it is essential that each group as a team be well informed of all actions which will affect them. In one sense, procedures should not be necessary for assigning responsibility; procedures should delegate authority and make it clear when one part of a job has been finished so that the next man can take up his share of the job. This concept tends to make procedure simple, for it presumes that the necessary steps of cooperation, liaison, and individual considerations in the inter-departmental operations will take place because of teamwork. To try to control such necessary action with paperwork can lead only to a red-tape stalemate.

\* Abstracted from paper 21T1-1, "Engineering Procedure in Product Designing," presented at the 21st ASTE Annual meeting. Copies of the complete paper will be available from the Society Headquarters.

By necessary teamwork is meant the necessity for the design engineer, for example, to work closely with the tool engineer during the course of design, for the designer cannot be expected to keep fully abreast of all developments in tooling. The word tooling is used here very broadly to cover all types of processing. Likewise, the tool engineer must understand the designer's position that a change to facilitate manufacture sometimes cannot be made without sacrificing product function and quality.

Without abandoning the contention that not all action from drawing board to production can be reduced to formal procedure, some procedures and standards are essential to meet the concept mentioned earlier, i.e., a procedure should delegate authority and tell when one part of a job has been finished so that the next man can take up his share of the job.

Because different companies commonly differ in detail organization, certain basic criteria should be established which will affect engineering procedures for product designing. These considerations are set down with the full realization that management authority is paramount:

1. The production engineering function has the authority to establish design, function and quality of the product. It has the responsibility of supplying other departments with complete information in order that they may perform their function.
2. The production function has the authority to determine how the product is to be made, also whether the parts are to be purchased or manufactured within the company, and to establish production schedules.
3. The purchasing function must buy materials and parts in sufficient quantities to meet production schedules.

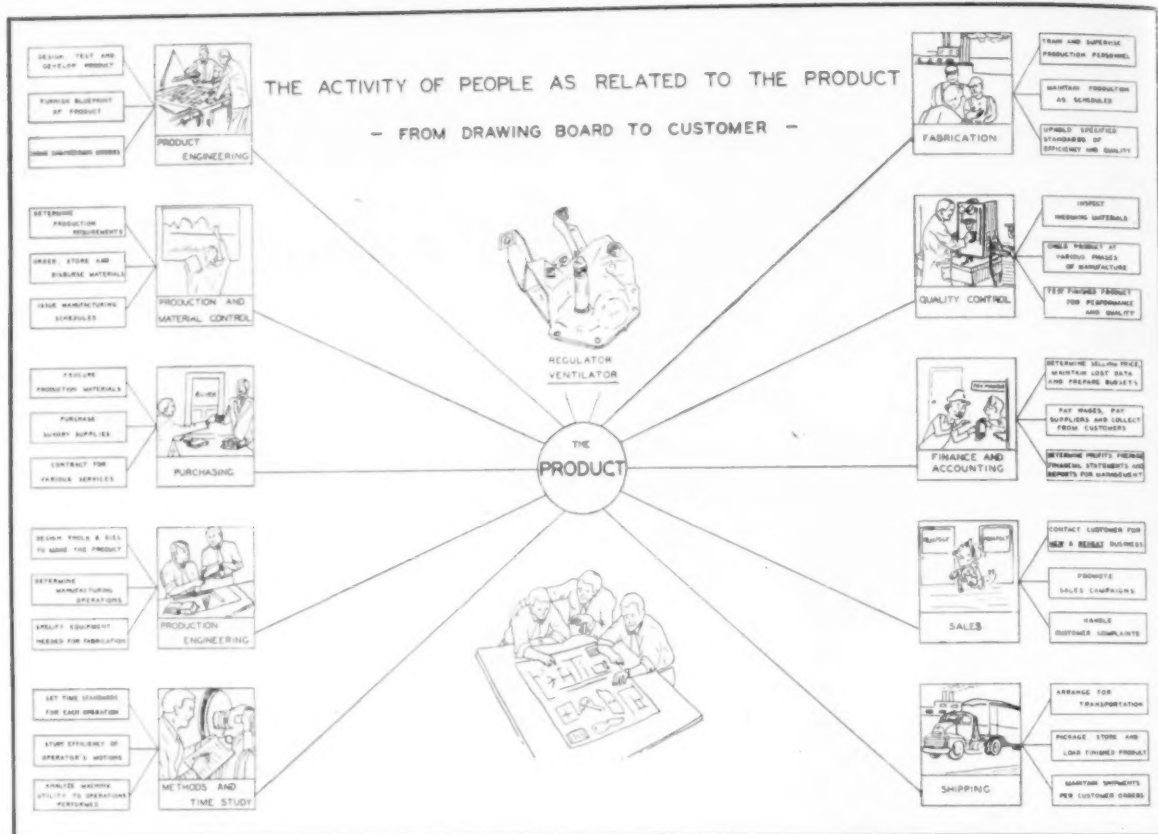


Fig. 1. The finished product represents the activities of many diversified departments.

To enable these functions to be performed, procedures should provide the following information:

1. Advice that a design is ready for production.
2. Provision of a copy of the latest drawing.
3. Specification of the parts necessary for a complete unit.
4. Data for the part—how many, where, and history.
5. Provision for change.

These five items are basic bits of information which concern almost every department of a company. Unless all departments have this information, with assurance that the data is current, they are handicapped and confusion results.

Item 5 is one of the most important of the items listed. Provision for change should be so planned that any affected department has the ability to request change. Equally as important is the necessity to inform all team members of a change.

#### General Motors Basic Procedure

The divisions of General Motors, in general, accomplish these steps in the following manner. The documents used are:

- Engineering release notices
  - Experimental
  - Preliminary
  - Final
- Copy of latest engineering print or drawing

Engineering production parts list  
Request for engineering change  
Engineering change notice  
Parts history card  
Distribution control of releases, notices and prints or drawings.

The engineering release notice, Fig. 2, is issued by Engineering to advise the various departments that a part has been approved by management for production. However, because of the lead times required by some departments, authority must be given them for action considerably in advance of the final release. This is particularly true of those parts which require extensive new tooling.

For this reason, a preliminary engineering release notice, Fig. 3, is used. This notice is the document which formalizes the cooperation necessary between design and tooling in the development of a new product. This notice passes authority to affected departments to proceed with their planning up to a certain point. For example, it may release a print for cost study only; it may authorize production to place orders for die blanks; it may request a tooling study; it may authorize a limited production run for evaluation of the parts from production tools; and other specific actions short of complete production. During this period the design is usually being further tested

CP-52-C REV.

**ENGINEERING RELEASE NOTICE**

PART NAME  
DISTRIBUTION & U.P.C.

LATEST DATE OF DRAWING

AFFECTS MODELS

MATERIAL

PART NO.

NUMBER OF PIECES PER CAR

DETAILS OF RELEASE—

NOTICE NO.

DATE ISSUED

ROUTING

EFFECTIVE

SIGNED

GENERAL MOTORS CORPORATION

Fig. 2. This engineering release notice is used to notify the various departments that a part has been approved for production.

by engineering while production and tooling difficulties are being solved.

In general, the preliminary release notice, except for its restricted nature, conveys the same items of information as the final notice which authorizes action necessary for full production.

The use of the preliminary notice occasionally differs from the final notice in other minor ways. A preliminary may release an assembly without separate releases of component parts; it is sometimes used for distribution of information and prints to a "standard" abbreviated list of recipients.

The full production authority is conveyed by a final release together with the latest drawing. In most GM divisions, a separate document is prepared for each detail part and assembly of the product. It is the means used to convey vital bits of information to all departments and also is the letter of transmittal for the corresponding part drawing. The release number is quite generally the same as the part number.

The basic information required on each release as recommended by GM standard practice is as follows: Name and address of issuing division, part number, part name, latest date of drawing, number of pieces required per unit, material, model

1952 R.E.A.

**PRELIMINARY ENGINEERING NOTICE**

NOTICE NO. \_\_\_\_\_

PART NO. \_\_\_\_\_

PART NAME \_\_\_\_\_

MODELS AFFECTED \_\_\_\_\_

LATEST DATE OF DRAWING \_\_\_\_\_

NUMBER OF PIECES PER CAR \_\_\_\_\_

MATERIAL \_\_\_\_\_

AFFECTS NOTICE NO. \_\_\_\_\_

THIS NOTICE IS ISSUED TO AUTHORIZE PRELIMINARY WORK ONLY AS DESCRIBED BELOW. ISSUANCE OF FINAL ENGINEERING RELEASE FORM CP52C AUTOMATICALLY VOIDS THIS NOTICE.

REMARKS:

ROUTING \_\_\_\_\_

DATE \_\_\_\_\_

SECTION \_\_\_\_\_

ENGINEERING DEPT. \_\_\_\_\_

Fig. 3. A preliminary engineering release notice is necessary to inform interested departments so that required advance actions may be taken to provide lead time.



Fig. 4. The parts lists, plus the release notice, contain all of the information necessary for each department to perform its part of the over-all job.

usage, supersedence, effective point, date issued, approval and issued by, any necessary special instructions, functional parts list group, distribution list for notice.

Depending upon detail practice and requirements, some divisions show additional data on the release. Thus, the release notice, plus the drawing and the parts list, Fig. 4, which follows the releases, gives all members of the team the data required to do their part of the job.

It should be pointed out that the drawing rarely indicates the functioning use of the part, or bears any parts list or bill of material data. Another practice of many of the divisions is that of re-releasing carry-over parts for a new model year.

The product engineering department is the authority for approving or denying changes in the product. However, progress is a continual change. Furthermore, advisability of change may occur in any department. Material shortages, manufacturing difficulties, simplification, product improvement and other factors, originating as apparent need for change, will happen throughout an organization. Therefore, a formal procedure must be used to facilitate control and handling of such matters.

This is done through the use of a request for engineering change, Fig. 5. This document may be initiated in any department. However, the request must be reviewed by all affected depart-

Fig. 5. A request for a change in specifications can be made by any department which feels that such a change is necessary to perform its function.

ments. A change may affect tooling, inventory, interchangeability, cost, or product quality and therefore must be approved by all parties having authority in those affected departments. Once the change is approved, notice is sent to all departments by the product engineering department.

The engineering change notice, *Fig. 6*, is distributed through the same channels as the engineering release notice. It carries the same data as the release notice plus the following: description of change, reason, disposition of old stock, effect on interchangeability, and effect on tooling. If the drawing has been changed, a revised print accompanies the change notice.

### Part Numbering Systems

In addition to basic procedures which convey information and authorize action, certain ground rules or standards are necessary. In mass production, a part numbering system is of extreme importance. This numbering system should meet the following requirements:

1. Provide exact identification of part
2. Prevent duplication of part numbers
3. Be expandable to meet future needs.

Part numbering systems fall into two types: nonsignificant and coded or significant. The latter type, by means of digit position, letter, or code, attempts to describe the part and its use. Significant numbering systems sooner or later fail to provide exact identification, promote duplication, and reach a point of being unable to expand.

Part numbers used by General Motors divisions are strictly nonsignificant. They are assigned to new parts in numerical sequence as new numbers are required. In this manner once a part number

is assigned, it simply is a part number, regardless of where or how used, or who uses it. Each division has a block of numbers assigned to it by the GM standards section. Although two or more divisions may use the same part, it is known by only one part number.

Drawing control is exercised by the division which designs the part. If a user division wants a change made, the change procedure is practically the same as outlined previously for intradivisional design changes.

The rules for drawing control, part number assignment, distribution of up-to-date vandykes among divisions are outlined to the GM Engineering Standards. These standards are evolved through committee action at divisional levels. They are not mandatory. But, having been a mutual development, they are followed by all divisions.

A basic rule of part number control is that having to do with changes which affect interchangeability. The rule is: if a change affects interchangeability (forward or backward), the changed design must carry a new part number, and the usage of the previous design and part number in respect to that application must be cancelled. This is effected through the use of the change notice.

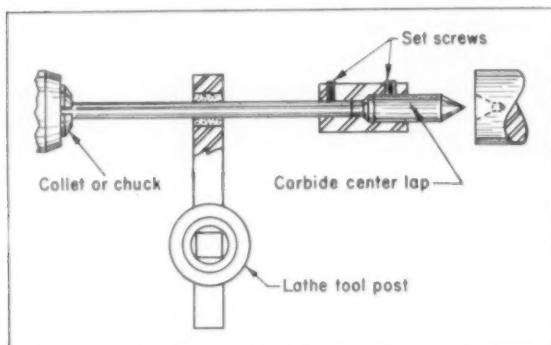
Although it may possibly not be considered a part of engineering procedure, a standard drafting practice is necessary to facilitate operations and to avoid mistakes in drawing interpretations. Most large companies now have their own standards of practice. However, due to the efforts of national technical societies, and the great dispersion of company drawings through large and small businesses, a basic single national standard may not be too far away.

Fig. 6. The engineering change notice is distributed through the same channels as the original engineering release so that all affected departments are kept informed.

GENERAL MOTORS CORPORATION		ENGINEERING CHANGE NOTICE	
PART NAME	DISTRIBUTION & U.P.C.	LATEST DATE OF DRAWING	PART NO.
AFFECTS MODELS		MATERIAL	NUMBER OF PIECES PER CAR
ROUTING		EFFECTIVE	
STOCK DISPOSITION		INTERCHANGEABILITY AFFECTED	
DATE ISSUED		NOTICE NO.	
APPROVED		SIGNED	
		PATTERN OR DIE TO BE CHANGED	

### Anti-Chatter Reamer Drive

Tungsten carbide 60-degree center reamers have been found useful for cleaning up center holes in heat-treated work prior to cylindrical grinding. While a fine tool for this purpose, they often tend to



chatter like an ordinary countersink. This leaves an unsatisfactory finish and sometimes causes serious chipping of the brittle carbide tool. The special tool driver and support shown in the accompanying figure has eliminated these troubles. Possibly this is due to the self aligning and torsion shock damping of the long slender driving rod.

Cold rolled bar stock or 5/16 drill rod six to eight inches long is used for the driving rod. The support is made of rectangular bar stock with an oilite bushing to provide a snug running fit for the rod. The hardened work is held against the rotating tool by supporting its right hand end on the lathe tail center while pressure is applied through the tail stock feed. The driving rod support, fastened in the lathe tool post, is moved either direction until best operation is obtained. It has been found possible to run the tool with this setup to the highest speed capacities of the machine. A thick solution of white lead and lard oil helps obtain a fine finish on this work.

H. J. Gerber  
Stillwater, Oklahoma

### Bushing Insertion

Insertion of large, close-fitting bushings or other cylindrical parts into holes is usually time consuming and frustrating because of tilting and subsequent sticking of the bushing. One solution to this problem is to grind a lead on the lower end of the bushing or pin. This lead is usually 0.002 to 0.003 inch smaller than the diameter proper and

about 1/2-inch long. Though an improvement, this method cannot compare with the results obtained with the special relief machined on the bushing shown in the accompanying illustration. The calculations for this relief are based upon the known diameter of the bushing and the known clearance per side between bushing and hole.

With  $D$  and  $C$  given, calculate other dimensions as follows:

$$\text{Relief Width} = 0.2 \times D$$

$$\text{Relief Dia} = 0.95 \times D$$

$$\text{Landing Width} = 1.4 \sqrt{DC}$$

$$\text{Chamfer Length} = 0.03 \times D$$

$$\text{Example: } D = 1\frac{1}{4} \text{ inches and } C = 0.001 \text{ inch}$$

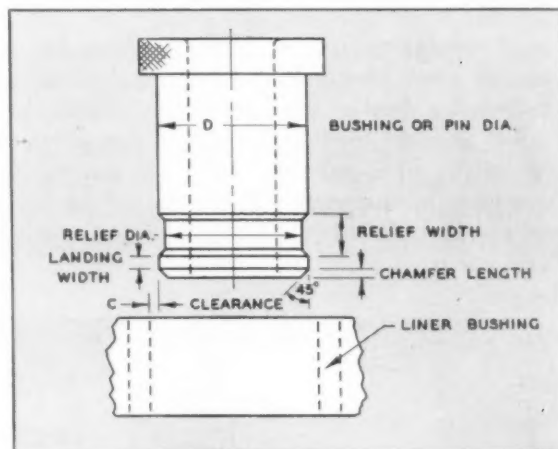
$$\text{Relief Width} = 0.2 \times 1.250 = 0.250 \text{ inch}$$

$$\text{Relief Dia.} = 0.95 \times 1.250 = 1.187 \text{ inch}$$

$$\text{Landing Width} = 1.4 \sqrt{1.250 \times 0.001} = 0.050 \text{ inch}$$

$$\text{Chamfer Length} = 0.03 \times 1.250 = 0.038 \text{ inch}$$

Male members with this relief are inserted without sticking. This principle also has been applied to

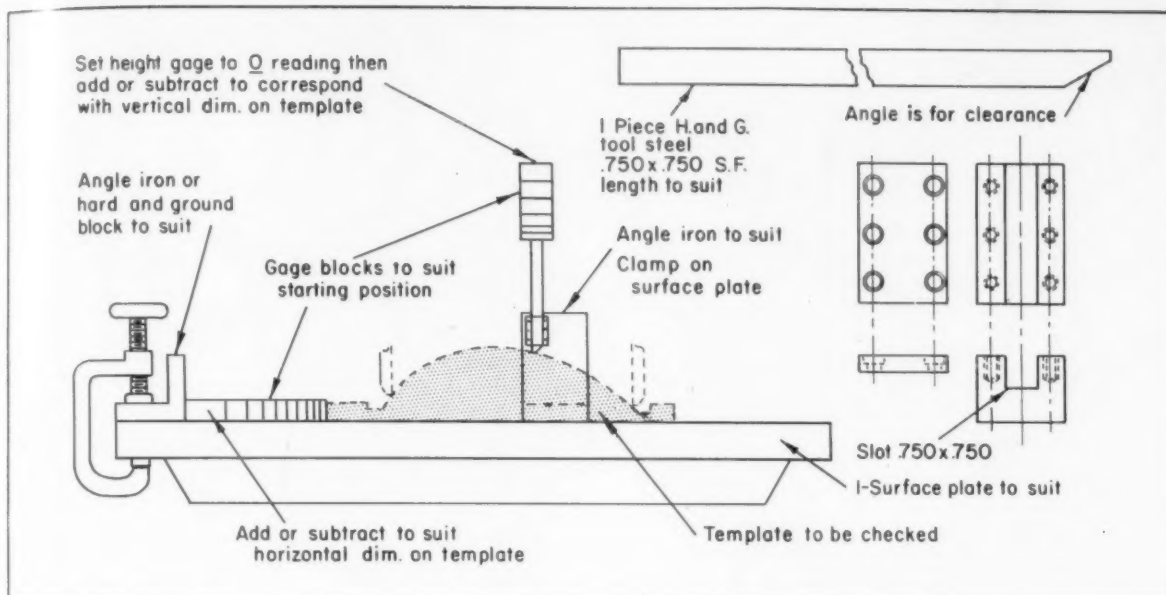


the design of boring bars that are floated through bushings, leader pins and many other component parts that must be slipped together during production operations.

H. G. Frommer  
Senior Member ASTE  
Milwaukee Chapter

Contributions for these pages describing short cuts for the tool engineer are welcome. Finished drawings are not necessary. Payment for accepted articles is made upon publication.





## Template Checker

The device shown in the accompanying illustration was designed to provide a quick and simple means of checking odd shaped templates and gages. It can be used on contour gages for plane propellers, both leading and trailing edge, and female templates, for example. At the right hand side of the sketch are shown details for making the sliding bar and groove block.

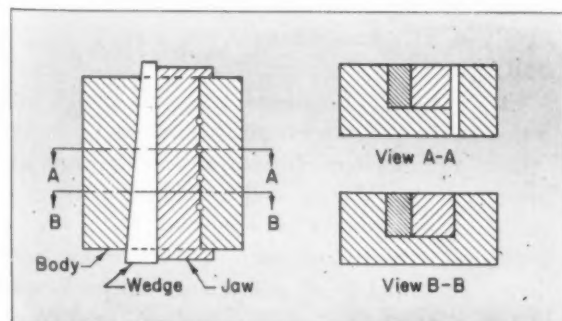
To use the template checker, adjust the angle iron holder to place the sliding bar at one end of the template according to the setup shown in the sketch. Set up dial indicator with height gage to read zero from top of gage blocks on sliding bar. To check the first dimension point from the template drawing, remove enough gage blocks to correspond with the horizontal dimension on the template, i. e. if the second station is  $\frac{1}{4}$  inch from the starting point, subtract  $\frac{1}{4}$  inch of gage blocks.

Move template against blocks. In the same way, subtract the proper amount from the vertical blocks, i. e. if the vertical station is  $\frac{1}{2}$  inch higher than the starting point, subtract  $\frac{1}{2}$  inch block. The dial indicator then can be used to check the variation in the template. If the template is perfect at that point, the gage will read zero. In this way, by adding and subtracting gage blocks, each dimension point of the template can be checked accurately without extensive calculations, and variations can be read directly. After checking the high point of the template, the sliding bar should be turned around to check the other end of the template, as indicated by the dotted position of the checking point. It is necessary to add to the horizontal dimension for successive readings, with the checker in this position.

Leo Bornhorst  
Dayton, Ohio

## Fixtures for Round Stock

A simple and efficient fixture to hold round workpieces, such as pins, rivets and screws in a vise for



bench machine work, is easily made.

The device consists of body, auxiliary jaw, and wedge made from a good grade of machine steel. After machining the three parts, assemble the tool and drill the holes clear through the fixture so that each hole is located half in the body and half in the jaw.

In operation, assemble the tool with the wedge quite loose; put the workpieces in place, close the fixture with a slight blow upon the head of the wedge. After finishing the working operation, open the fixture by a light blow upon the point of the wedge.

Federico Strasser  
Santiago de Chile

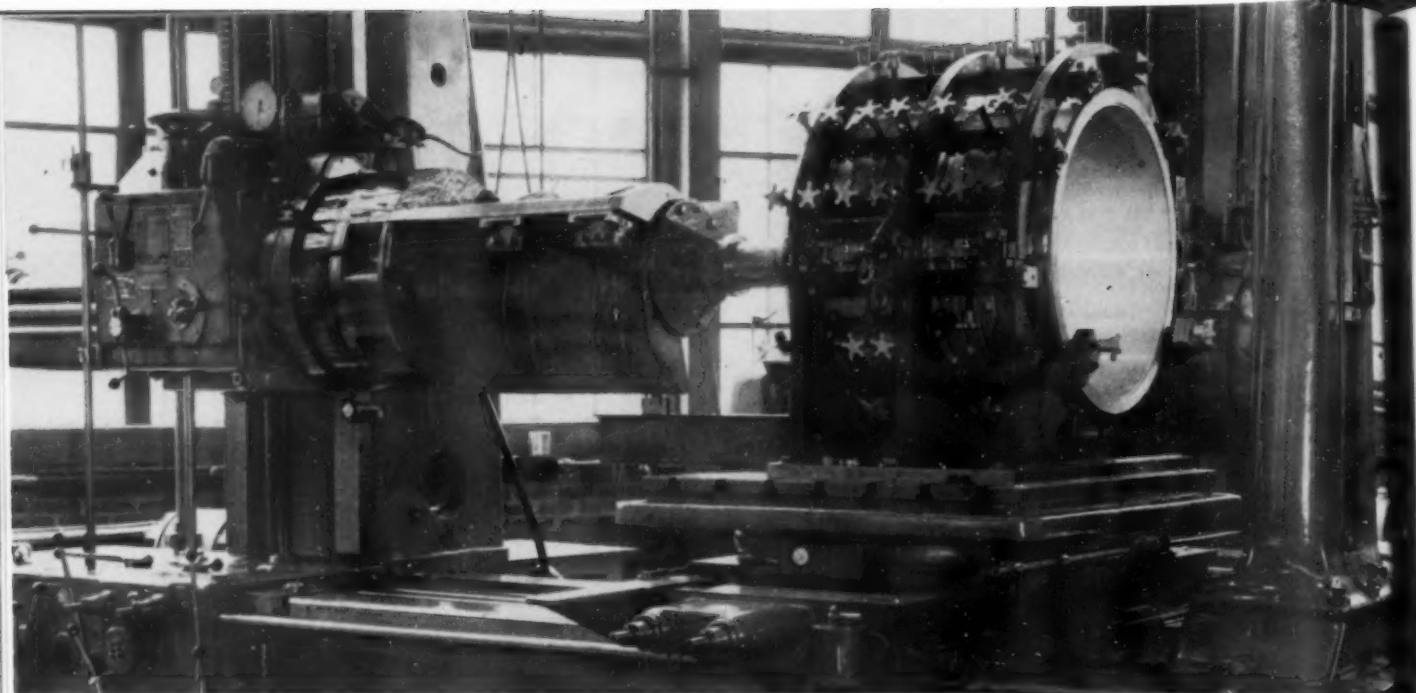


Fig. 1. Multiple-tool cathead on horizontal boring mill. The table holding the fixture and workpiece will be traversed toward the machine column so that the work will envelop the cathead. The manually operated fixture has since been replaced by a multiple operating hydraulic fixture.

## UNIVERSAL TOOL

### Performs Intricate Boring Operations

By John Stokvis and Eugene Edera\*

Stokvis, Edera and Co., Inc.

New York, N. Y.

**A**LTHOUGH MANY TYPES of machines will bore internal diameters of a large variety of parts, there has been need for improvement in this field, especially for boring large diameters. Realization of this need was accentuated by the tooling requirements for the manufacture of jet engines.

As in all other technical developments, the end product creates the need for the best adapted tool needed for its production. The designer of the tool must of necessity follow the design of the piece to be machined. While in the later stages of the manufacture of certain everyday items, the manufacturing processes have actually influenced product design, this certainly cannot be the case in the matter of gas turbine or jet engines.

The machine tool industry has reacted quickly

\*Senior member ASTE Greater New York Chapter

to the need for machines specifically adapted to the manufacture of jet parts, e.g., lathes which can swing large diameters and special-purpose grinders. When it came to boring some of these parts, however, perplexing problems arose.

As an example, an important component of every gas turbine is the compressor casing. It is a magnesium or aluminum alloy casting about 30 inches long with a 28-inch diameter and a relatively thin wall section.

Only one type of machine, a vertical boring mill, was available for the various operations to be performed on this piece. The major operations on this piece consist of facing and rabbetting both ends, cutting stator grooves, and boring. On a vertical boring mill, single tools perform the various operations. To complete all operations, the piece must be turned around.

In research that resulted in the design and manufacture of the Stokvis Edera multiple-tool cathead, the following end goals were the prime considerations:

1. To develop a tool that would have built-in adherence to tolerance
2. To obtain higher production per machine tool unit
3. To use a machine on which the piece would be stationary and the tools mobile.
4. To provide distortion-free piece clamping and to do so equally along the entire periphery of the piece
5. To devise a two-point support tool and machining method by which the tool thrust would be absorbed axially and not laterally by the toolhead
6. To provide for quick change-over possibilities in case of design changes
7. To perform as many operations as possible in one setup

The multiple-tool cathead combines these requisites. Mounted on a standard table type Forges de Gilly boring and milling machine, *Fig. 1*, it is now machining compressor casings in an hour and a half, a tremendous saving over all previous methods.

The cathead is a three-armed casting bolted onto the standard facing plate of the machine. Inside is a mechanism that is connected to the machine's spindle. By simply moving the spindle in or out (choice of 72 feeds), the tool slides placed at appropriate positions are fed out radially or retracted radially. Thus, lateral spindle movement is translated into radial tool-slide movement.

For cutting grooves, all tools are fed out simultaneously into the ID of the workpiece in a plunge-cutting operation. Facing is done by selecting tool slides at both ends so that the piece is both faced and cut to length in one operation. Boring is performed by feeding out a selected number of tools to their predetermined positions and then moving the entire piece-carrying table for the precalculated

distance. Taper-turning can be obtained by pre-selecting correct ratio of tool in-or-out feed with table feed.

As many as 30 tools can operate simultaneously and, with indexing turrets, the cathead can accommodate 120 tools in all. The relative locations of the tools can be changed rapidly to any desired combination.

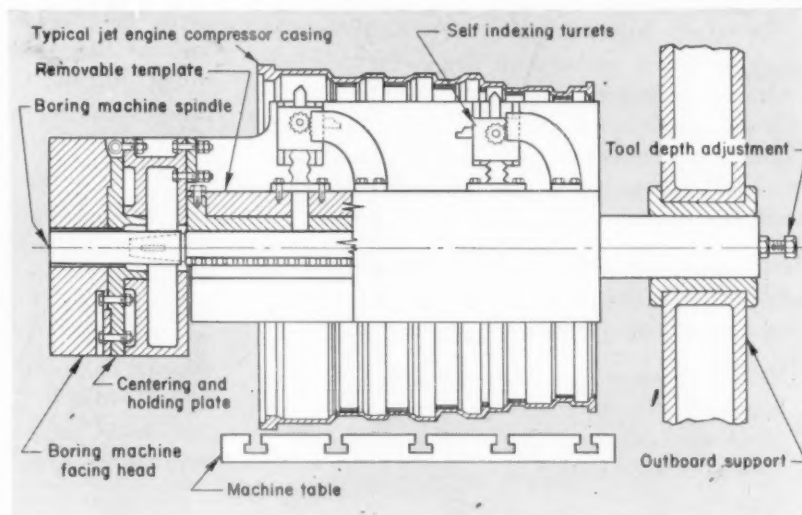
**Cathead Design:** Referring to *Fig. 2*, the cathead for which patents are pending was designed as a casting having three arms, located 120 degrees apart, integral with the center section. The driven end is bolted to the facing head of the horizontal boring and milling machine. In order to provide rigidity during machining, a bearing end is provided. In operation the bearing end is supported by the standard boring stay of the machine.

The cutting tools are held in self-indexing turrets. Mounted on the arms of the cathead, these turrets are spaced as desired. Relative location of each is determined by the characteristics of the piece to be machined. A typical arrangement of turrets is shown in *Fig. 2*. Should engineering changes dictate, the relative positions of the turrets are easily changed.

Relocation is accomplished by the turret positioning device. This device consists of a template having holes jig-bored so as to correspond with the desired center line of each turret. This is possible inasmuch as power can be taken from any point along the entire length of the centerpiece. The upper end of each of the three arms is provided with a removable turret affixing plate which can be changed when turrets are relocated. These plates eliminate the necessity of drilling into the arms themselves.

Referring to *Fig. 3*, the radial feed of the turrets is obtained as follows: A shaft having three racks cut 120 degrees apart and located in the centerpiece

**Fig. 2. Layout drawing for multiple-tool cathead showing positions of tool turrets.**





is able to move axially. One end of this shaft mates with the spindle of the horizontal boring machine by means of a taper and keeper shown in Fig. 2. The turrets may travel radially along the surface of each arm in a dovetailed slot.

Feed is transmitted to the turrets by a shaft, one end of which contains a pinion meshing with one of the three racks. The other end has an acme thread cut into it. This thread engages with an internal

In order that the sequence of operations may be performed accurately and rapidly, the workpiece is located in a quick-acting hydraulic fixture mounted on the table of the machine. Rapid and positive location is insured by hardened dowels which are an integral part of the fixture. These dowels fit into dowel holes which have been bored into the center-line lugs of the casing. After placing the casing in position, holding clamps are applied to these lugs. Thereafter, the upper half of the fixture is secured in place. To provide full peripheral support, as many as 50 hydraulic pressure pads are simultaneously brought into contact with the outer periphery of the compressor casing.

While the piece is being loaded the cathead is supported by a roller mounted on a cantilever beam affixed to the table, as shown in Fig. 1.

### Dowel Pins Locate Work

Locating of the workpiece in the fixture is done with respect to two dowel holes which have been accurately drilled and reamed in the machining lugs. In order to assure full dimensional accuracy at the end of the machining process, these locating points are used in all the subsequent machining processes. The positions of the dowel pins in the piece-holding fixture have been used as a point from which to measure a spot on the table of the horizontal boring machine against which measurements during the machining process can be taken.

With the proper relationship between the locating pins and this spot on the table near the ways established, dial indicators and gage rods simplify the work of the operator. Moreover, by performing all the operations in one setup and using the same repetitive method of taking measurements, concentricity and critical dimensions are maintained within the desired tolerances.

With the workpiece positioned in the fixture and located by means of the dowel pins, the table of the machine is fed towards the facing head. In so doing, the multiple tool cathead is inserted into the internal diameter of the workpiece, its bearing end fitting into the bearing of the outer support. In this position the piece is ready for the first operation.

Since the first operation is facing the ends and cutting the respective rabbets, the table of the horizontal boring machine must be placed in correct cutting position. This is done by choosing the proper gage rod, placing it in the trough and traversing the table until a zero dial reading is obtained. To assure parallelism of the two faces, the turrets which in this case are the first and last turrets on the cathead, are indexed so that they each have the facing tools ready for cutting.

All other turrets in the meantime have been

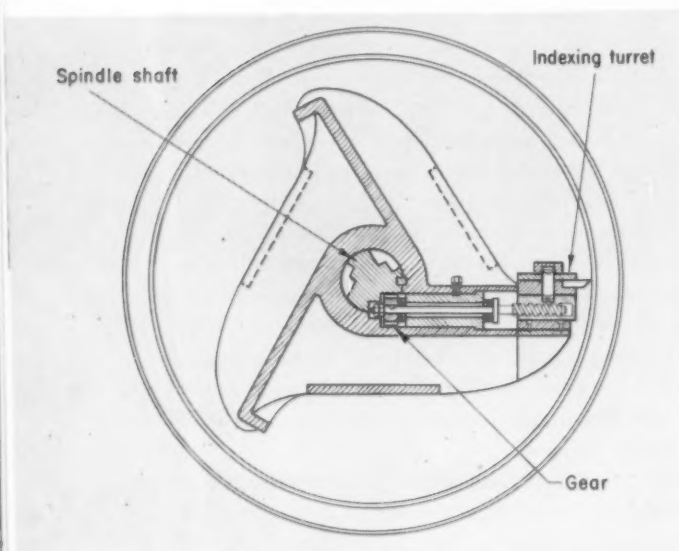


Fig. 3. Cross sectional view of cathead mechanism which translates axial spindle movement into radial turret movement along cathead arms.

thread cut into a bronze bushing which is located in the turret.

Radial feed of the turrets is obtained as follows: The spindle of the horizontal boring machine is fed axially at a predetermined rate. Since the rack shaft is keyed to the spindle, it feeds axially at the same rate as the spindle. By means of this axial feed, the pinions meshing with the racks revolve and, in so doing, turn the shaft which is threaded into the turret. Since the shaft may only revolve, whereas the turret has straight line radial motion, the advance at the acme threads will feed the turrets axially a proportional amount. All of the 72 different feeds, per minute and per revolution, available in the machine itself may be transmitted to the turrets. Fig. 4 shows the cathead schematically.

**Machining Operations:** The following is a breakdown of the operations performed on a typical jet engine compressor casing:

1. Proper locating of piece in suitable fixture
2. Machining front and rear faces
3. Rough and finish boring grooves for stator rings
4. Rough and finish boring
5. Taper boring

indexed so that they present a blank face to the inside diameter of the case. Indexing is automatic. All that is required to index the turrets is to retract them by reversing the axial feed of the spindle beyond the starting point. Feeding the turrets back to the starting position locks them in their indexed position.

Power is applied to the cathead at a preselected speed. In this particular instance it has been found satisfactory to use a speed of approximately 60 rpm. With the cathead rotating, the facing and rabbeting tools are fed out radially by engaging the axial feed of the spindle until the facing cuts have been completed.

The facing tools are then retracted beyond their starting point, thereby automatically indexing the turrets into a position for the next operation, which is rough grooving. Rough grooving is accomplished by plunge-cutting the tools into the internal diameter of the case to a predetermined depth. Since the depth of cut is an extremely critical dimension to maintain, a trip mechanism disengages the axial feed of the spindle when required depth has been obtained. The rough grooving operation requires no movement of the table since the grooves are cut in the same position as the faces.

### Cut Depth Predetermined

Straight cylindrical boring of the internal diameter is the next operation. With the grooves already rough machined, the boring tools are positioned so that the cut starts within one of the grooves and terminates in one of the succeeding grooves. In order to bring boring tools into position for the cylindrical boring, the indexing procedure is repeated.

Depth of cut is predetermined by reading the vernier which governs the spindle axial feed. When the boring tools have been fed in this manner, rotary power is applied to the multiple cathead and the table of the horizontal boring machine is traversed. By moving the table approximately four inches and using six tools, a cut of twenty-four inches can be obtained.

For taper boring the proper tool is brought into position by the indexing system. Then the radial feed of the tools and the longitudinal travel of the table are engaged simultaneously and with the correct relative feeds a taper can be cut. In the establishment of the correct ratio, the ratio of radial feed to longitudinal feed is equivalent to the tangent of the angle of the taper.

While it is possible to perform all the operations on one machine, there are some casings that require operations to be performed in rough boring and rough grooving machines, and in finish boring and finish grooving machines. Therefore, in these par-

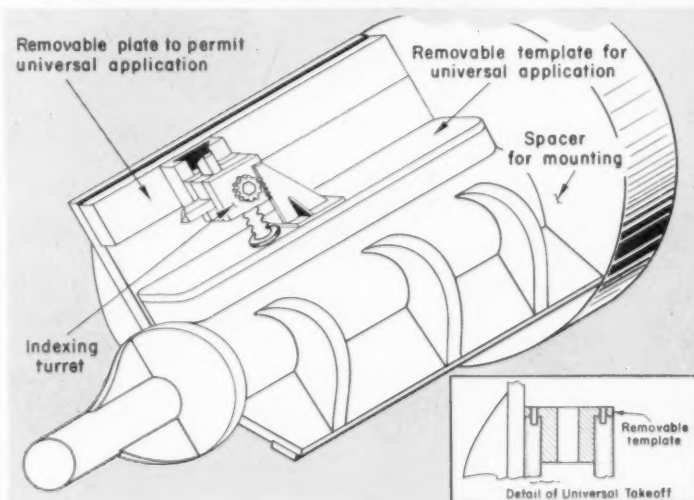
ticular cases where two machines are required, the work is divided so that the finishing machine can take the finishing cuts at a higher surface speed than the roughing machine, thereby enhancing finish.

In order to maintain a low temperature rise during machining, to wash away chips and to keep the tool clear at all times, coolant is introduced through suitable piping to impinge directly ahead of the tool. The coolant rate used is approximately 15 gallons per minute. If it is desired to further restrict the temperature rise of the workpiece, refrigerating coils can be introduced into the reservoir of the coolant. In a particular installation currently operating and employing in general the method outlined in the foregoing, floor-to-floor time on the complete operation is an hour and thirty minutes. This time could be improved by refinements in materials handling.

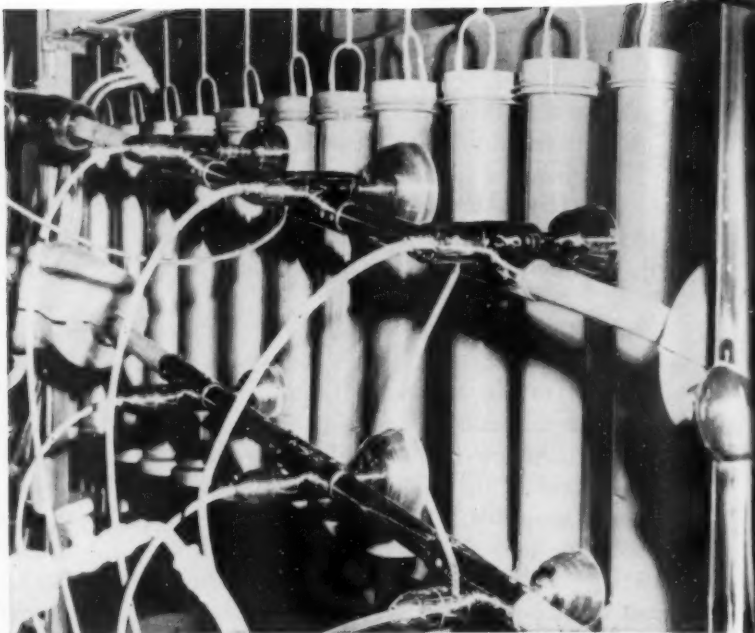
Insofar as cutting tools are concerned, it has been found advantageous to use high-speed steel tools. A great number of pieces have been obtained without tool regrinding. Paradoxically, it has been found that a relatively dull edge which gives a quasi burnishing effect is more satisfactory than an extremely sharp edge. The use of high-speed steel tools has, moreover, relieved the tool and cutter grinder departments and the cost of these tools, often of intricate form shape, is considerably reduced.

Production advantages are obtained through the use of this particular machining method. By keeping a fixed locating point and following this point throughout all processes of internal working of the compressor casing, dimensional accuracies are assured. The automatic feed control mechanisms and the simplicity of operation allow the use of the machine by a relatively unskilled operator.

Fig. 4. Schematic view of cathead showing general construction and turret arrangement.

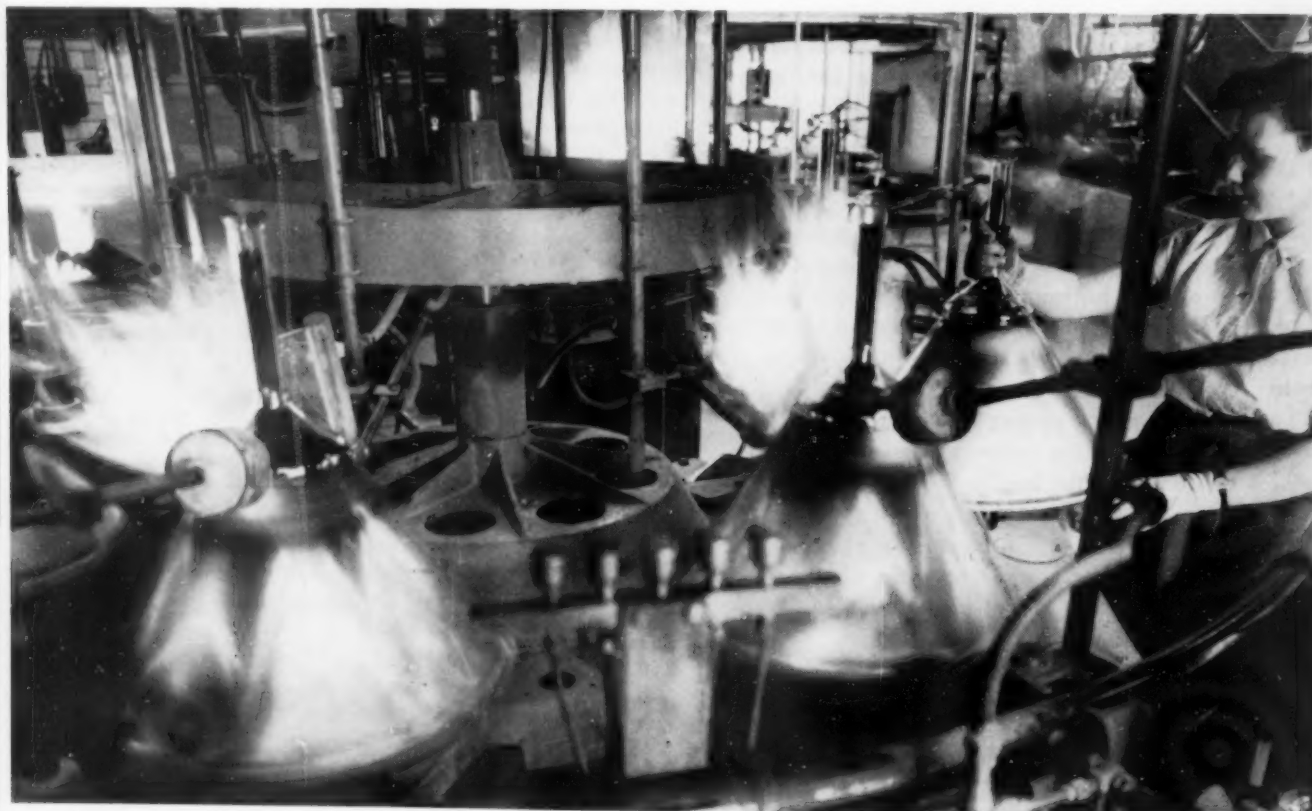


# TOOLS at work

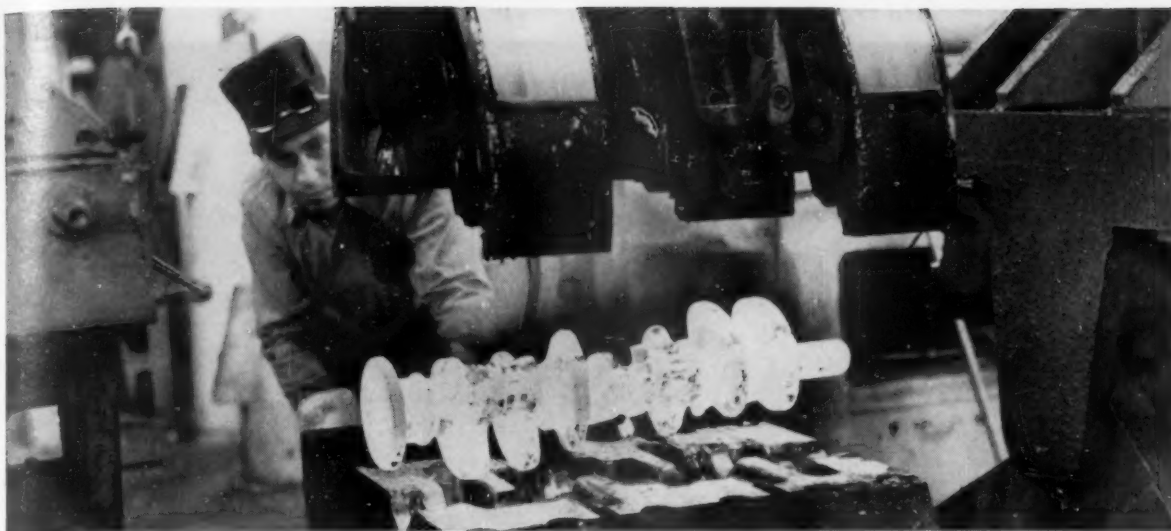


Automatic electro-spray painting speeds up defense production in this conveyor line. Three-inch, 50-caliber cartridge tanks are being sprayed for the Navy by the Ransburg system which employs electrostatic force to atomize the paint. No booth is required, only exhaust for solvent vapors.

Metal-cone television tubes in process of assembly at Westinghouse's Elmira Plant. A neck of soft glass is being joined to the back of the cone in the rotary sealing machine. As the tube rotates from position to position the metal and glass parts are preheated, joined and annealed. The operator is setting the cone and glass neck in the machine. Tubes in the foreground are going through final annealing stages and will be removed when they reach the operator.







Forged flat, a white hot V-8 Dodge engine crankshaft is being indexed in a hydraulic twisting machine which twists the crankpin bearings into proper alignment.

Stainless steel reeds for textile looms emerging from tungsten carbide forming rolls at Knowles Loom Reed Works, New Bedford, Mass. Straighteners in the foreground flex the rolled product to remove the cast imparted by rolling. The rolls operate at about 70 rpm. Switching to carbide rolls for this application saved manpower, increased runs, improved finish and reduced rejects resulting from variations in manufacture.

Grooving cast-steel cable drums on a 50-horsepower vertical mill. A  $1\frac{1}{8}$ -inch pitch groove,  $\frac{1}{8}$ -inch deep is cut at 15 revolutions per minute. Machined in 19 cuts, the drum will accommodate a  $1\frac{1}{4}$ -inch diameter wire rope on heavy earth moving equipment.

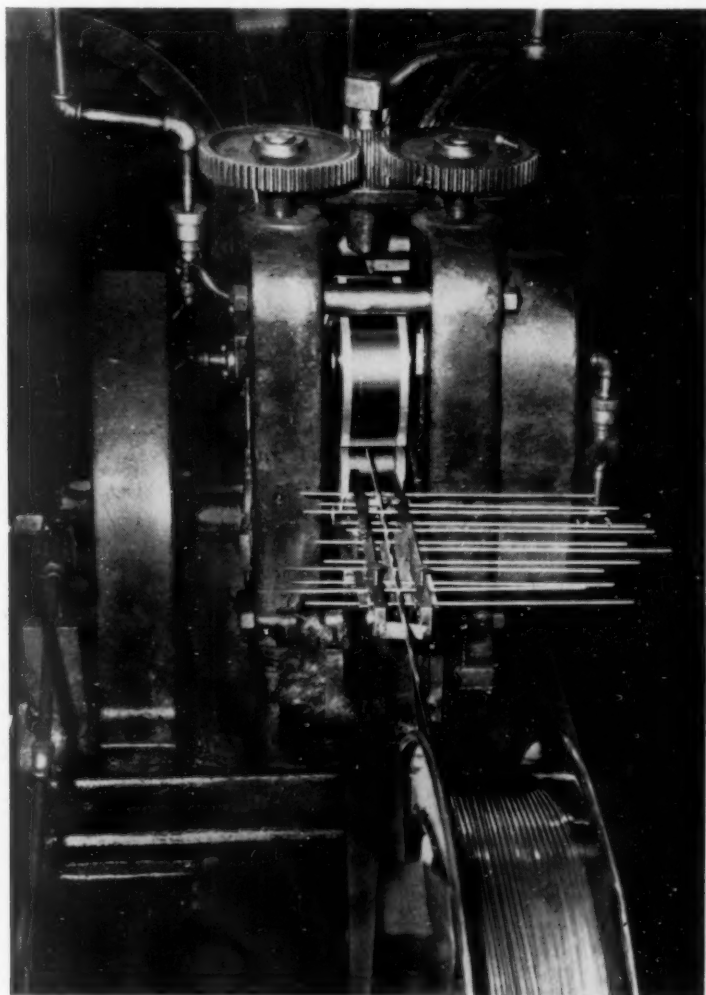
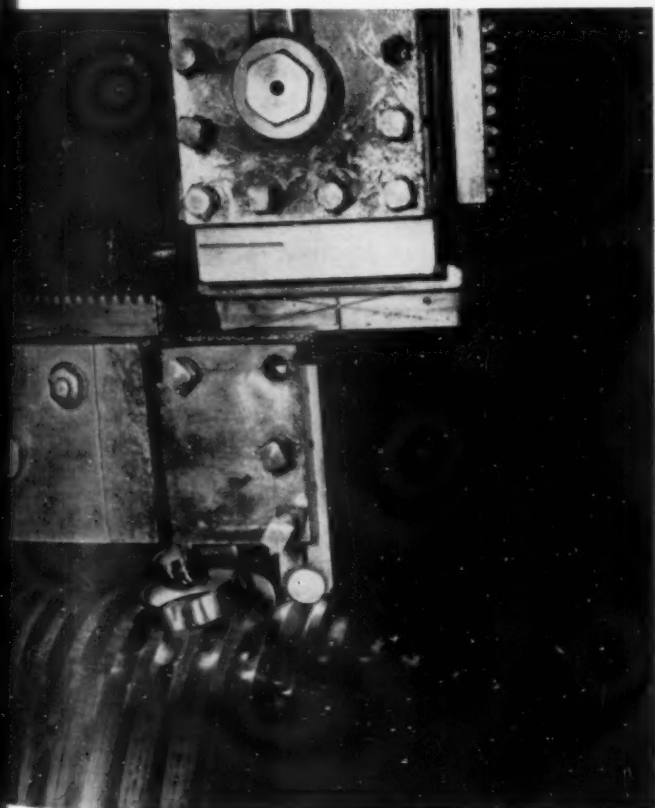


Photo-Courtesy Kennametal Inc.

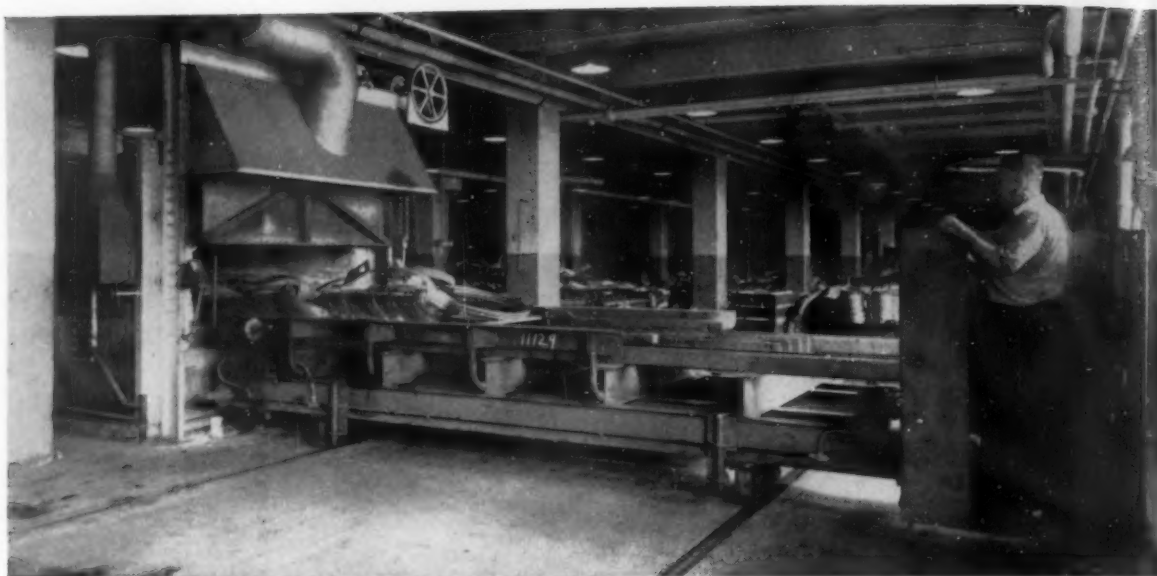


Fig. 1. One operator charges the annealing furnace, using the transfer car for loading and unloading the furnace. The same man also operates the furnace.

## TRANSFER CAR Eliminates Overhead Handling

By W. J. Krailing

Furnace Engineer Bridgeport Brass Co.  
Bridgeport, Conn.

WHEN A BRASS MILL has limited room for handling materials in the vertical plane, it is confronted with a critical operating problem. Most heavy materials handling equipment is designed for transfers, using overhead cranes and similar facilities.

In taking over the wartime Navy shell plant at Bridgeport, Conn., the Bridgeport Brass Co. acquired a fine building, but the ground floor had a working overhead space of only 12 feet. This floor was to be used for extensive nonferrous wire and rod drawing operations, embracing all types of copper base alloys in a wide range of compositions and sizes. With the limited head room in this department, fork lift trucks instead of the usual overhead cranes are used to lift and transport loads to the various operations. Copper slings are utilized to lift the unit loads and, in operations such as annealing and pickling, usually remain with the load being processed, thereby facilitating

quicker and more efficient handling.

Similar loading and handling problems were encountered when setting up heat treating equipment for the finish annealing of brass wire. An ingenious "pan-pull" furnace solved the problems. This furnace, designed and built by Surface Combustion Corp., permits loading and unloading of pans by means of the fork lift trucks used to transport the wire coils. It also eliminates the need for overhead handling of material which was almost impossible under the conditions existing in the converted plant.

This furnace employs a perforated chrome-iron pan about  $\frac{1}{4}$  inch thick,  $5\frac{1}{2}$  feet wide and 12 feet long for carrying the charge of wire to be annealed. The perforations are about  $\frac{3}{8}$  inch in diameter and are located on staggered 1-inch centers. Roller rails are provided to facilitate moving the pan into and out of the furnace.

Wire is loaded onto the pan as the pan rests on

a loading table. A transfer car is then moved up opposite the loading table. The pan is drawn onto the transfer car by means of a multiple hook device mounted on a roller chain and built into the car. Then the car is moved on its tracks for a few feet until it is opposite the furnace door, *Fig. 1*. After this door is raised, the loaded pan is moved from the transfer car into the furnace by means of a pusher head on the transfer car roller chains. Loads of approximately 8,000 pounds of wire are processed in about  $2\frac{1}{4}$  to 3 hours, depending upon the time and temperature required. Rods are also annealed in this same furnace.

After the charge has been held for the required time at the annealing temperature, the handling process is reversed and the pan drawn from the furnace onto the transfer car. The car is then moved on its tracks until it is opposite the air cooling chamber. This chamber, designed to provide rapid cooling of the wire to convenient handling temperatures, is equipped with an air-operated door. When the pan is moved by the transfer car mechanism onto the rails of the air cooling chamber, the fan in the roof of the cooling chamber is started. Air is drawn from the partly opened door of the cooling chamber up through the perforated pan and through the wire, then vented through a 4-foot square hole in the roof of the chamber. Heated air is carried off at this point by a duct which also serves to vent the annealing furnace.

This particular air cooling chamber was developed to provide for maximum speed of cooling of the wire charges. Cooling in this chamber is further accelerated by means of water-cooled copper coils around the side walls and roof of the chamber. The cooling of the high zinc brasses must be carefully controlled to prevent the precipitation of the beta phase which makes the rods and wire hard and thus difficult to machine. A water spray is also available in this cooling chamber, but is only infrequently used because of the pan warpage which it causes.

Annealing, as practiced in the nonferrous industry, is usually defined as heating above the recrystallization temperature of the alloy. Stress-relieving is the term applied to heating operations at temperatures just below the recrystallization temperature of the alloy. Stress relieving is usually carried out at temperatures 45 to 55 C below the recrystallization temperature to maintain a factor of safety.

Most of the wire annealing work carried out in the pan-pull furnace is at temperatures in the range of 420 to 570 C, although the furnace is used for temperatures as low as 275 C for stress relieving and up to a maximum of 675 C for annealing.

Finish annealing specifications for brass wire

are based primarily on grain size, Rockwell hardness and tensile strength. This annealing furnace provides extremely close control of the wire by all these standards. Uniform properties of the wire are obtained because of uniform temperature in the coils produced by the high rate of circulation of the heated products of combustion in the convection furnace.

True metal temperatures are obtainable in a convection-type furnace. For this reason, unequal size coils will respond comparably to equal crystal size specifications, provided the time cycle is sufficiently long for complete saturation of the heaviest coil. The lightest coil meanwhile will not have exceeded the desired temperature and thereby will not have become softer, notwithstanding the somewhat longer time of exposure at temperature.

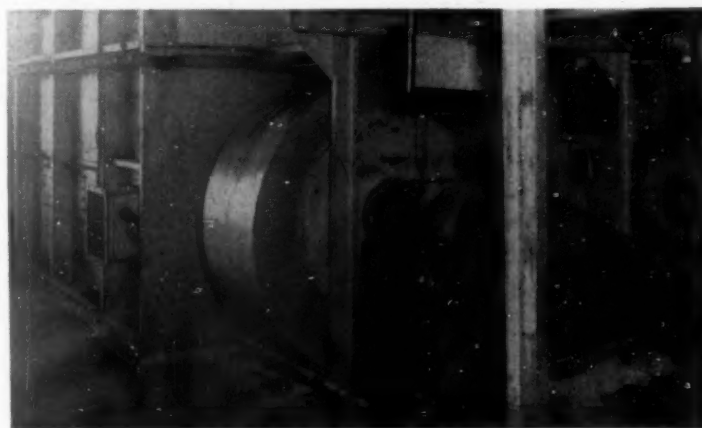
In this furnace, all of the products of combustion, after leaving the fan, must pass through the charge before returning to the fan. This positive circulation of the heated gases is implemented by the perforations in the loading pan which make possible passage of the gases through the load rather than over it.

Frequent grain-size measurements are made of the wire on each coil processed in the furnace and remarkably uniform grain-size values are obtained. Samples, cut from each batch of wire, are polished and examined under a microscope. The grain size is then reported as the average grain diameter in millimeters at 75 X magnification.

The air heater is a special refractory-lined unit located at the upper rear of the furnace. It is equipped with a low-pressure automatic-proportion velocity burner and constant burning pilot. The air heater burns 530 BTU carburetted water gas and has a maximum fuel consumption of approximately 3000 cubic feet per hour.

Average fuel consumption for 8000-pound net charges of brass wire annealed at temperatures of

**Fig. 2. The rear end of the annealing furnace, with the high capacity blower unit at lower center and the air heater unit at upper right.**





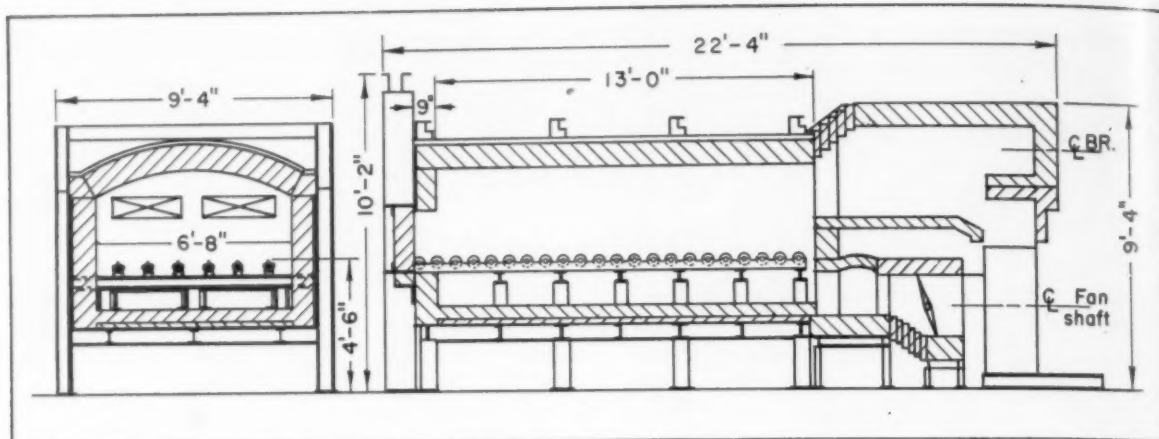


Fig. 3. Schematic drawing showing the construction of the finish annealing furnace.

approximately 500 C is about 1500 cfh. The control valves on the combustion equipment are actuated by extension handles at shoulder height from the floor. This feature has eliminated the need for frequent trips by the furnace operator to the combustion equipment control platform. Automatic temperature control equipment is used to maintain uniform temperature in the furnace. Also located at the rear of the furnace is the recirculating fan which recirculates the heated gases to and from the furnace chamber. This alloy fan has a rated capacity of approximately 14,000 cfm of air through the work. The fan is driven by a 25-hp, 1800-rpm motor, Fig. 2.

The furnace, Fig. 3, has a heating chamber with

an internal width of 80 inches and an internal length of 156 inches. To meet the height limitations of the building, the furnace has an over-all height of approximately 126 inches and allows the door to open to a height of 24 inches. Over-all width of the furnace is 112 inches, and over-all length 268 inches. The side walls are fully insulated with insulating firebrick and block insulation. Insulating firebrick forms the arch. The bottom is composed of insulating firebrick plus a considerable thickness of block insulation.

On the hearth of the furnace, 9 roller rails are located on 9-inch centers, running the full length of the furnace chamber. These rollers and rails are cast 35-15 chrome-nickel steel.

## Cleaning with Ultrasonics

AS INDUSTRY and science are delving deeper into the mysteries of natural power, they also are learning more about harnessing it for work. Now comes the development of an advanced, practical method of metal cleaning through use of ultrasonic waves. Although the idea is not revolutionary, since experiments have been conducted for several years, it does overcome physical limitations which have surrounded earlier experiments with quartz crystals.

Prime feature of the method, known as the Soniclean Process, is a man-made element for directing sound energy. Technicians of the Detrex Corp., who developed the method, foresee its opening the door to many advances in a variety of industrial fields.

The element, engineered jointly by Detrex and the Brush Electronic Co., is a curved piece of ceramic resembling a six-inch-long pipe, cut in half length-wise. The pieces, which can be connected in series and arranged as desired, are designed to offer focusing and flexibility properties.

In operation, electrical energy is transmitted to

the ceramic transducer, converted into sound energy, and projected through a solvent at a frequency of 430,000 cycles per second. The solvent Detrex is using currently in the Soniclean Process is trichlorethylene, although it is not limited entirely to this material. The transducers operate at 40 V and can be safely immersed directly in the solvent, avoiding complications of sealed containers.

Material to be cleaned is placed in the solvent—manually or by conveyor—directly in the path of greatest focal intensity of the ultrasonic waves. Extreme turbulence is created in this area, resulting in a penetrating cleaning action that removes dirt, grease, chips etc. almost instantly from even intricately designed or close fitting parts.

Design of the ceramic transducer causes the sound waves to converge to a straight line the length of the transducer. Focal area in other transducers has been confined to a single point, thus effectively restricting cleaning to a one-at-a-time rate—impractical for industrial demands.

# Analysis of Maximum Temperatures in Workpieces

By A. O. Schmidt

Research Engineer  
Kearney & Trecker Corporation

RECENT INVESTIGATIONS show that metal-cutting involves many problems of heat flow, temperature distribution, friction and behavior of metals which are unique and complex. This discussion deals mainly with the state of workpieces with respect to sensible heat. The temperature gradient in workpieces while being milled and the existence of very high instantaneous surface temperatures during the cut have been determined experimentally.<sup>1</sup>

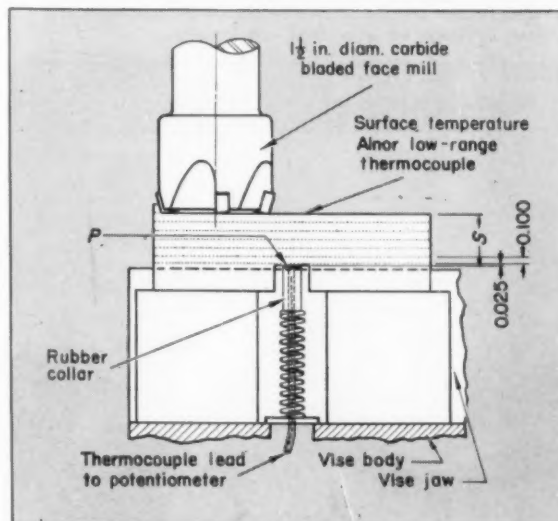
Work done in a metal-cutting operation can be measured in the form of heat in the workpiece, chips and tool. Most of the heat is in the chips, but usually from 5 to 30 percent of the total heat goes into the workpiece with the greater percentage occurring at lower speeds. It has been proved in many tests and often can be observed visually that tool tips frequently fail because of the very high temperatures attained near the cutting edge. However, excessive temperatures in the workpiece are seldom noticed in casual or general observations, but special tests confirm that high instantaneous temperatures occur in the machined surface of a workpiece during the machining process.

In these and prior tests,<sup>2</sup> when measuring the surface temperatures of equal-sized steel workpieces with a manually operated external Alnor low-range thermocouple immediately after a milling cut has been taken, it was found that a number of factors entered into what then were determined as the surface temperatures, which were above room temperature up to 130 F. Cutting speed and feed had the main influence upon the surface temperature. Increases in either the cutting speed or the feed led to decreases in the workpiece surface temperature after the cut. Rake angles also had a certain effect

on these temperature readings. Negative rake angles, which require more power than positive angles under otherwise identical conditions, caused higher surface temperatures and more deformation of the microstructure near the surface of the workpiece than did positive rake angles.<sup>3</sup> Average chip temperatures *also* increased with a finer feed or greater negative rake angle.

The workpiece temperature, obtained with a surface thermocouple after a cut had been completed; was influenced by the size, specific heat, conductivity of the workpiece and holding devices. Only average workpiece surface temperatures existing several seconds after the surface had been formed

Fig. 1. Test arrangement for measurement of workpiece temperatures. In the determination of maximum surface temperature the cutter was replaced by an oxyacetylene flame moving over the workpiece at the same feed rate and causing an identical temperature rise at *P*.



<sup>1</sup>Numbers refer to bibliography at the end of the article.

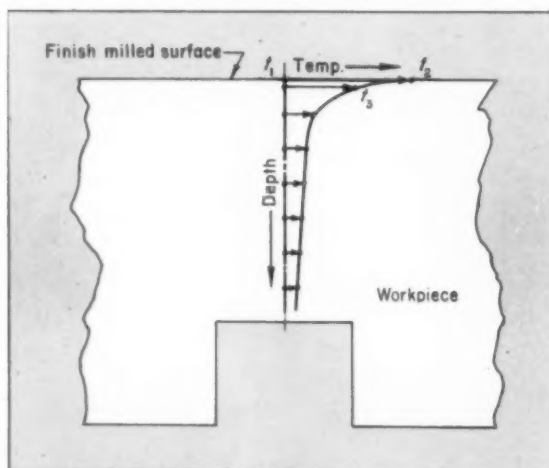
were measured previously, because of the difficulties encountered in trying to determine the magnitude of the metal being ground is not unreasonable and Ordinarily, larger workpieces dissipate the heat of cutting rapidly and no effects seem to be visible, but temper colors often appear on very thin sections of machined surfaces. However, since more heat and greater temperature increases are produced by finer chips, as has been measured in milling, drilling and turning tests, still higher temperatures are encountered in grinding and similar operations.

In practice, it has been observed that buffing can draw the temper of the surface of hardened steel workpieces. According to Shaw,<sup>5</sup> temperatures over 3000 F. accompany fine surface grinding. Their computed values, based on dynamometer and other measurements, exist for such extremely short periods of time that verification by actual temperature or thermal measurements is difficult and can be only approximate. However, the momentary existence of temperatures above the melting point of the metal being ground is not unreasonable and affords plausible explanations of some of the phenomena encountered in fine grinding operations.

### Temperature Gradient in Workpiece

The main object in the tests reported here was to determine experimentally as closely as possible the maximum temperature occurring in or near the surface of a workpiece while it was being milled. Temperature readings were taken at several different levels in the workpiece as seen in the test arrangement shown in Fig. 1. The test bar had a slot in the center where the thermocouple *P* indicated the temperature as the tool cut through the workpiece material. As was to be expected, the temperatures recorded were highest when the surface being cut was closest to the thermocouple.

Fig. 2. Aid to interpretation of charts indicating maximum temperatures attained at and beneath the surface of a milled workpiece.



The general temperature distribution in a workpiece while being machined is illustrated in Fig. 2. For the last cut the thickness of the remaining layer was only 0.025 inch, Fig. 1, and the potentiometer used did not respond fast enough to indicate the peak temperatures which were therefore obtained with temperature-indicating crayons. When the distance *S* was 0.125 inch or greater, a time lag always occurred before the maximum temperature was attained. The highest temperature reading at *P* during the first cut, for a distance *S* of 0.750 inch, was obtained 8 seconds after the tool had finished machining the surface of a steel test bar. As the cutting tool approached closer to *P*, the temperature increase was obtained in a progressively shorter time.

Because of better heat conducting properties, these elevated temperatures were reached sooner in nonferrous materials than in steel. When SAE 1030 steel test pieces were milled at speeds above 400 fpm, blue temper colors were visible on the underside of the 0.025-inch thick layer after the last cut. Temperatures were therefore high enough and existed for a time sufficient to produce temper colors in the thin sections of the test bar and to change the colors of temperature-indicating crayon marks. The potentiometer responded too slowly to indicate a temperature anywhere near the maximum surface temperature in the workpiece because the temperature gradient is very steep in that narrow region. Only when the temperatures farther away from the surface were measured was it possible to use this thermocouple equipment with better accuracy, since it took a number of seconds before the maximum temperature was reached. This meant that an entire section of the workpiece had been heated. Since a general temperature rise throughout a workpiece is caused by the cutting action, the tool can be considered as a heat source. This heating action of the tool can be reproduced by a heating element to obtain temperatures in the workpiece similar to those recorded during actual cutting.

In the next series of tests, an oxyacetylene flame, mounted on a carrier which moved at the same feed rates as used in machining, was employed to simulate the heat-producing action of a tool. The maximum temperatures in Figs. 3 to 9 is the temperature determined at the workpiece surface through oxyacetylene flame or the gaseous layer beneath it which caused a temperature gradient in the workpiece similar to that produced by the cutting tool. The test bars,  $\frac{1}{2} \times 1\frac{1}{2} \times 4$  inches, were SAE 1090 (170, 311 and 387 Bhn), gray cast iron, free machining brass, aluminum and magnesium. On these graphs are plotted the temperatures measured at various distances from the surface being machined. In most cases, each plotted point is the



average of three tests made with a sharp cutter.

The three-bladed cutter used for tests plotted in Figs. 3 to 9 had a 6-degree negative primary radial rake 0.020 inch wide at the cutting edge of the carbide blades which were placed at a 15-degree positive radial rake angle in the cutter body. The peripheral clearance angle was 6 degrees, the face relief angle 3 degrees, the face clearance angle 5 degrees, and the face cutting edge angle 1 degree.

With the  $\frac{1}{2}$ -inch wide test bar, the heat flow was not unduly influenced by the cooler holding devices. Comparative cuts were taken on test specimens of various widths up to 1 inch. On test bars wider than  $\frac{1}{4}$  inch, the temperatures were almost equal, while on those narrower than  $\frac{1}{4}$  inch, the temperatures were lower because the heat was conducted away at a faster rate by the relatively cold vise jaws. However, when test pieces  $\frac{1}{8}$  inch wide were insulated from the vise jaws, the temperatures measured were higher, but not so high as those for  $\frac{1}{4}$  inch or larger thicknesses.

Workpiece temperatures as recorded when cutting SAE 1030 test bars of 180 Bhn at a cutting speed of 328 fpm are shown in Fig. 3. The solid line indicates the temperature of a test bar  $\frac{1}{4}$  inch wide, while the dotted line represents temperatures of a test bar  $\frac{7}{8}$  inch wide. Values for test bars of  $\frac{1}{2}$  inch,  $\frac{5}{8}$  inch, and  $\frac{3}{4}$ -inch width fell between these curves. The graphs in Figs. 4 to 9 are for test bars of  $\frac{1}{2}$ -inch width.

Test results when milling SAE 1090 test bars of 170 and 387 Bhn under identical conditions are presented in Figs. 4 and 5. Each data point plotted in Fig. 4 is the average of six tests. Higher temperatures, Fig. 5, were measured when cutting the same steel at 387 Bhn. In all the tests shown in Figs. 4 and 5, the cutting speed was 590 fpm and the feed 25 ipm or 0.0055 inch per tooth. Fig. 6 shows the temperature values obtained at a lower cutting

speed of 80 fpm and a feed of 0.0055 inch per tooth, all conditions, excepting speed, being the same as for the tests plotted in Fig. 4.

The temperatures obtained indicate that the workpiece heats up much more during the slow cut, because a greater quantity of heat can flow from the shear zone to the workpiece. The workpiece

Fig. 4. Maximum surface temperature of SAE 1090 workpiece, 170 Bhn, and temperatures at distance S. Cutting speed-590 fpm, feed-0.0055 inch per tooth.

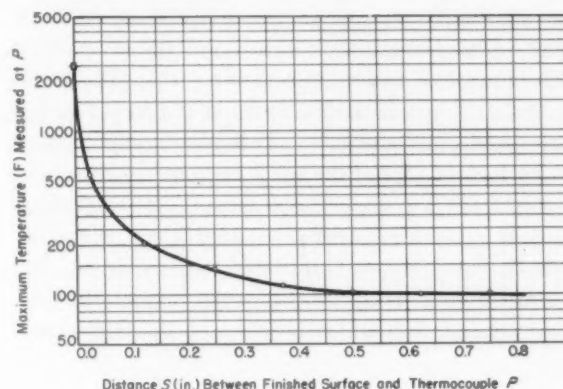


Fig. 5. Maximum surface temperature of SAE 1090 workpiece, 387 Bhn, and temperatures at distance S. Cutting speed-590 fpm, feed-0.0055 inch per tooth.

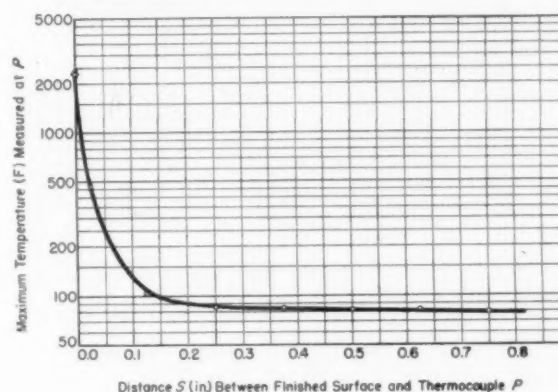


Fig. 3. Influence of width of workpiece upon maximum surface temperature of SAE 1030 workpiece, 180 Bhn, and temperatures at distance S. Cutting speed-328 fpm, feed-0.0055 inch per tooth. Solid line for workpiece  $\frac{1}{4}$  inch thick, dotted line for  $\frac{7}{8}$ -inch thickness.

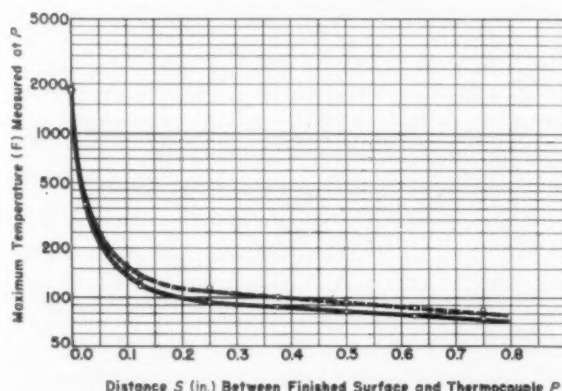
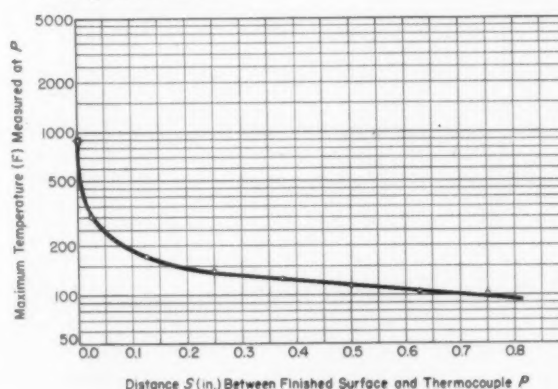


Fig. 6. Maximum surface temperature of SAE 1090 workpiece, 170 Bhn, and temperatures at distance S. Cutting speed-80 fpm, feed-0.0055 inch per tooth.



temperature closest to the surface and the indicated maximum surface temperature were, however, much lower than they were at the higher speed. The slow moving oxyacetylene flame was mounted some distance from the workpiece to cause the same temperature rises as the cutter at 80 fpm cutting speed. In Fig. 7 are shown two temperature curves obtained for lower and higher cutting speeds, all other conditions being the same during the steel milling operation.

The temperature of the workpiece surface can be attributed mainly to the work done or heat evolved in forming the chip from the workpiece. When the tool begins to remove a chip, the metal in the chip and in a thin layer in the workpiece is deformed simultaneously. This plastic deformation is the largest part of the work required in removing a chip from a workpiece and most of the work done in a metal-cutting operation occurs, therefore, as heat in the chip. An additional, but much smaller, source of the heat in the chip is the friction between the tool and chip which occurs as soon as the chip

begins to move on the tool. The amount of heat in the chip constitutes, as a rule, between 50 and 75 percent of the total heat in chip, tool and workpiece together. The smaller figure of 50 percent applies to the lower speeds; the heat in the chips increases to 75 percent at about 200 fpm.<sup>6</sup> At the lower speeds a measurable part of the heat from the shear zone is transferred by conduction to the workpiece, since there is contact for longer periods of time. Less of this happens at higher cutting speeds.

Temperature values as obtained when milling cast iron were similar to those in Fig. 4. The effect of a worn cutter when milling 24-ST aluminum alloy is shown by the dash line in Fig 8 in comparison to the temperatures obtained with a sharp cutter as indicated by the solid line. In this case the wear could be considered minor and no difference in the cutting action had been noticed by ordinary observations. Free machining brass, which has generally lower power requirements, also registered low temperatures in the workpiece. Magnesium alloys are usually exceptionally easy to machine and this was confirmed by correspondingly low values of workpiece temperature measurements, Fig. 9. Although the maximum surface temperature as plotted for milling magnesium alloys is low in comparison to those for the other materials, it is much higher than the temperature measured near the tip of a lathe tool machining the same material at a comparable speed and feed.<sup>7</sup>

### Computation of Temperatures

Quantitative values of metal-cutting temperatures have been calculated by Shaw<sup>5</sup> based on the analysis of a moving heat source by Blok<sup>8</sup> and Jaeger.<sup>9</sup> Another procedure to calculate metal-cutting temperatures as influenced by speed, feed and physical properties of tool and workpiece materials has been proposed by Loewen,<sup>10</sup> postulating a stationary and a moving heat source.

Fig. 7. Maximum surface temperature of SAE 1090 workpiece, 170 Bhn, and temperatures at distance S. Cutting speed-590 fpm (circles) and 80 fpm (dots), feed-0.0055 inch per tooth.

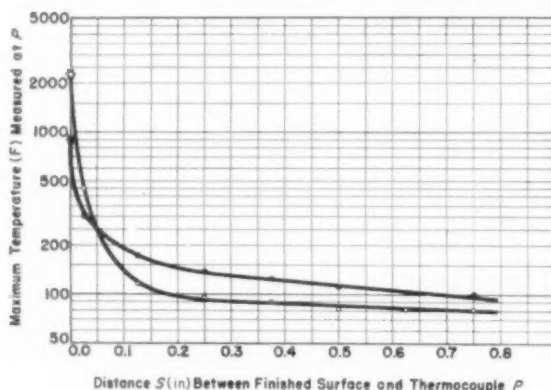


Fig. 8. Maximum surface temperature of 24ST aluminum workpieces and temperatures at distance S. Cutting speed-590 fpm, feed-0.005 inch per tooth. Solid line, sharp cutter, dotted line, dull cutter.

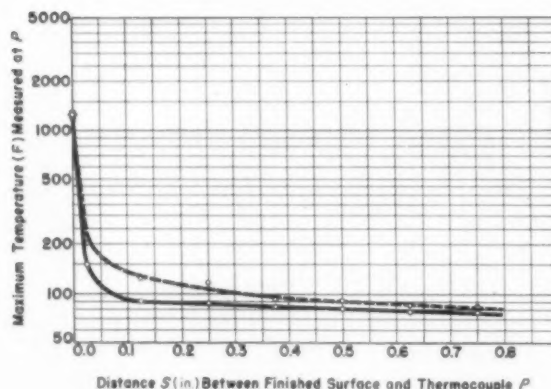
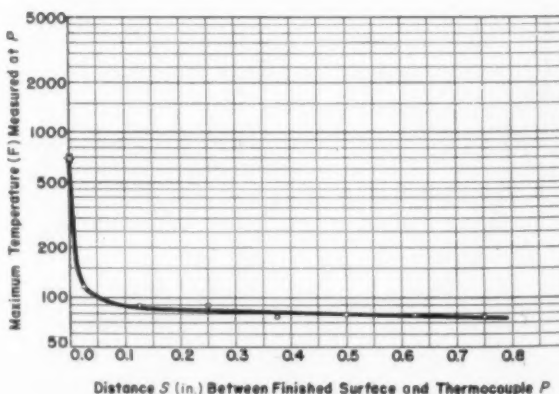


Fig. 9. Maximum surface temperature of a Mg alloy workpiece and temperatures at distance S. Cutting speed-590 fpm, feed-0.005 inch per tooth.



From a consideration of the intensity of separation of the chip material from the workpiece, and the diminishing amount or degree of deformation at points successively further away from the surface, it can be concluded that a temperature gradient or differential exists across the depth of the deformed layer immediately following its formation. Although the exact manner of temperature distribution is not known, it is possible to make simple computations based on an average uniform temperature assumed to exist across this comparatively thin layer immediately after machining.

In X-ray diffraction investigations,<sup>3</sup> the depth of penetration of plastic deformation beneath the surface of a milled workpiece was found to be several thousandths of an inch, varying with the rake angle. Under the specific test conditions—SAE 1020, 590 fpm cutting speed, 0.005 inch per tooth feed, 0.100 inch depth of cut, and 6 degree negative rake angle—the affected surface layer was 0.004 inch deep.

It has been established in correlative tests that, of the total work expended in a metal-cutting operation under conditions similar to those existing in these tests at 600 fpm cutting speed, approximately 10 percent of the entire energy is confined to the workpiece in the form of heat. All of this machining heat in the workpiece must initially be contained in the thin deformed surface layer for a short period of time before dispersing itself to the cooler metal beneath. Thus it is possible to compute for this layer a maximum average temperature which, although lower than the instantaneous surface temperature, at least provides an indication of the magnitude of that temperature, e.g., higher than tool-tip or surface temperatures measured during the cut. If the heat existing for a short period of time in a very small segment of the completely insulated cold-worked surface is considered, the results of temperature computation will be the same.

The high temperatures are not ordinarily noticed or measured since they are flash temperatures accompanying the generation and transfer of comparatively small quantities of heat which are generally quickly distributed throughout the large volume of the workpiece.

The temperature of the workpiece ( $t_3$  Fig. 2) in the last pass across a 0.025-inch thickness was determined with a fair degree of accuracy and it can safely be stated that the temperature  $t_2$  on the surface must have been still higher. This can be verified by computing the maximum average temperature for the 0.025-inch thick remainder of the workpiece by the above method of thermal balance. These computed temperatures will always be greater than those determined experimentally.

Such high surface temperatures were also de-

termined in the experiments of Bowden and Ridler<sup>11</sup> in which a rotating ring of mild steel was in contact with a stationary cylinder made of another metal having a melting point lower than that of steel. The maximum temperature, obtained with the thermocouple thus constituted by virtue of the dissimilar metals in contact, was the melting point of the metal having the lower melting point. This melting temperature could be obtained either by increasing the load on the cylinder at a definite speed or by increasing the speed while maintaining the load constant.

Once the melting temperature had been reached, the temperature remained at that point whether speed or load was increased further. These tests have a definite relationship to a metal-cutting operation because two dissimilar metals, the tool and workpiece, are engaged in relative sliding movements at high speed and tremendous pressures. Fig. 10 is an illustration of the general location of heat sources in chip and workpiece. These tests, in which the tool material was tungsten carbide hav-

Fig. 10. Heat sources during chip formation: 1, due to compression; 2, due to friction; 3, due to tear; 4, due to shear.

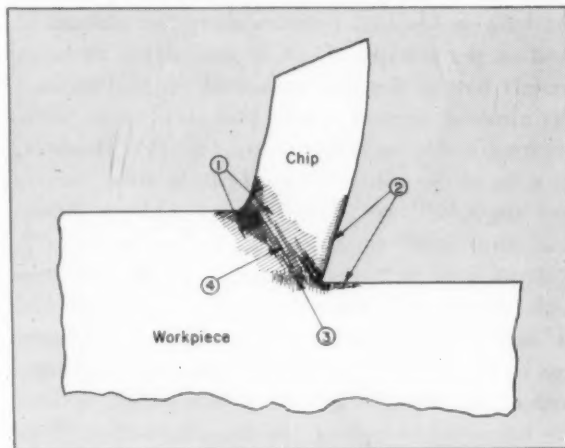
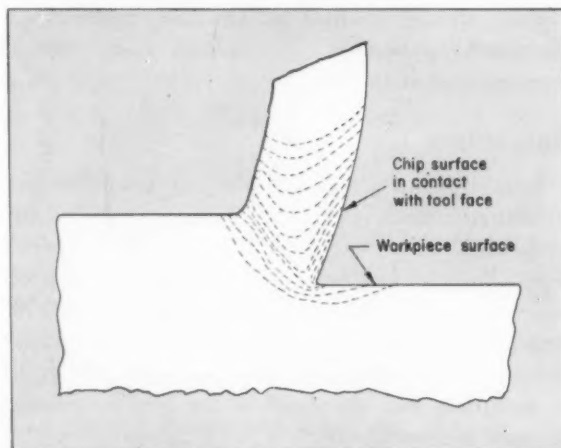


Fig. 11. Thermal picture during continuous chip formation with sharp tool.





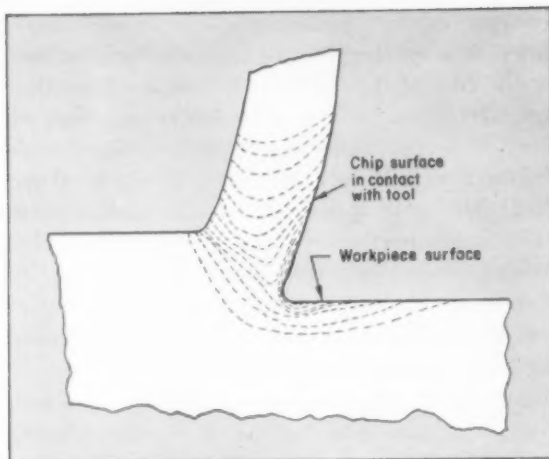


Fig. 12. Thermal picture during continuous chip formation with dulled tool.

ing a higher melting point than any of the workpiece materials, indicate that at the workpiece surface an instantaneous temperature exists which can be close to the melting point of the workpiece.

The amount of heat in the workpiece has been computed by Chao and Trigger.<sup>12</sup> Their analysis pointed out that the heat in the workpiece will decrease with increasing cutting speeds. This has been confirmed experimentally with sharp cutters. As long as the tool remains sharp the amount of heat in the workpiece can be considered as being mainly part of that heat caused by the tool through deformation in and around the shear zone while forming a chip as illustrated in Fig. 11. However, as soon as the cutting edge begins to wear, the relief angle will be decreased and additional heat will occur in the workpiece due to friction, Fig. 12. Rate of wear at the cutting edge usually increases with harder and tougher workpiece materials and at higher cutting speeds. Generally, workpieces are large enough to absorb the heat of machining without detriment. Only when thin-walled sections are machined at cutting speeds sufficiently high to entail more rapid tool wear, or high-strength workpiece materials are cut, will the heat in the workpiece become troublesome. In such cases lower cutting speeds, more positive rake angles, and abundant application of coolants can prevent warpage and distortion.

### Conclusions

Instantaneous workpiece surface temperatures, which are much higher than measured tool-tip temperatures, can occur in a metal-cutting operation. The tool can be considered a heat source of high temperature at high-cutting speeds and a heat source of lower temperature at lower-cutting speeds. This heat source advances along the work in each case with the speed of the feed movement through the workpiece.

The surface temperatures depend upon the workpiece material being machined; those materials which require more power under otherwise identical conditions of speed, feed, depth of cut and tool angles will also have higher temperatures at the surface and in the workpiece.

The maximum surface temperature is lower with decreased cutting speeds, but at the same time the temperatures within the workpiece are higher because a larger percentage of heat flows into the workpiece at the slower rate of separation of chips.

Extremely high cutting speeds in steel milling and in machining of other high strength materials cause rapid deterioration at the cutting edge and therefore very high temperatures at the machined surface, often resulting in warpage of the work.

ACKNOWLEDGMENT: Mr. J. R. Roubik of the author's company assisted in carrying out these tests.

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Fig. 1. Replacing steel routers with carbide tools on this multiple machine eliminated much downtime because of the carbide wear ratio of 50 to 1. Workpieces are furniture legs.



## Carbides Increase Production of Wood Products

By Ray C. DuBrueq

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APPLYING CARBIDE TOOLS in the woodworking industry has created many problems similar to those experienced when carbide tools were introduced in the metalworking industry. Compared with conventional tooling, carbides for woodworking have advantages of greater volume of production, less down time for tool sharpening and replacement, *Fig. 1*, higher quality finish, closer tolerance dimensions and reduction in number of operations. Also, the substitution of pecan and imported hardwoods for maple, walnut and others in short supply, the adoption of hard and abrasive urea glue, and the widespread use of plywoods created new problems in tooling which are being solved with the intelligent use of carbides.

As an example of a typical woodworking application, carbide tipped shaper and molder head knives are used extensively on standard shapes for

long production runs where exact duplication of shape must be maintained throughout the run. Steel knives might vary in shape from repeated regrinds, but carbide blades, *Fig. 2*, often can be used to complete the entire run without removal for sharpening. In one case, a carbide-tipped molder head lasted over two months on a continuous glue line operation. The steel knives previously used dulled in two days.

Another difficult job, *Fig. 3*, involved sizing tops and rounding corners of 7-ply  $\frac{1}{2}$ -inch thick desk tops. Operating at 3600 rpm with 20 fpm feed, carbide cutters take from  $\frac{1}{8}$  to  $\frac{3}{4}$ -inch cut with and against the grain, producing 8000 to 10,000 pieces between grinds. Formerly, steel cutters made 600 pieces per grind and had to be changed every  $1\frac{1}{2}$  hours.

In shaping theater seat arms, *Fig. 4*, from red-



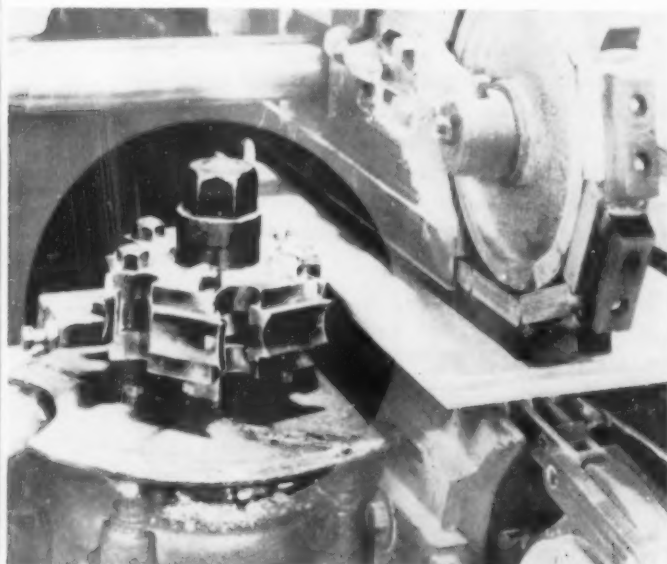
Photo—Courtesy Carbology Dept. G.E.

**Fig. 2.** Typical carbide tipped shaper and moulder head knives.

tangular maple blocks, one company estimates an annual savings of \$10,000 through the application of carbide heads. This operation, run at 7200 rpm, formerly netted 2000 pieces in an 8-hour shift with two operators. Now one operator produces 5000 pieces per day. Depth of cut is 1½-inch maximum with and against the grain at a feed of about 18 fpm. When steel knives were employed, the head was removed for sharpening after every 200 pieces. Now 25,000 to 30,000 pieces are run between grindings. Also, this particular job eliminates a spindle sanding operation. The pieces go direct from shaper to the polishing machine. For resharpening the face of the cutter only is ground and, although

**Fig. 4.** (bottom right) Carbide-tipped tool for shaping theater seat arms increased man-hour production five fold.

**Fig. 3.** (bottom left) Tenoner equipped with carbide-tipped head. This machine sizes and rounds desk tops.



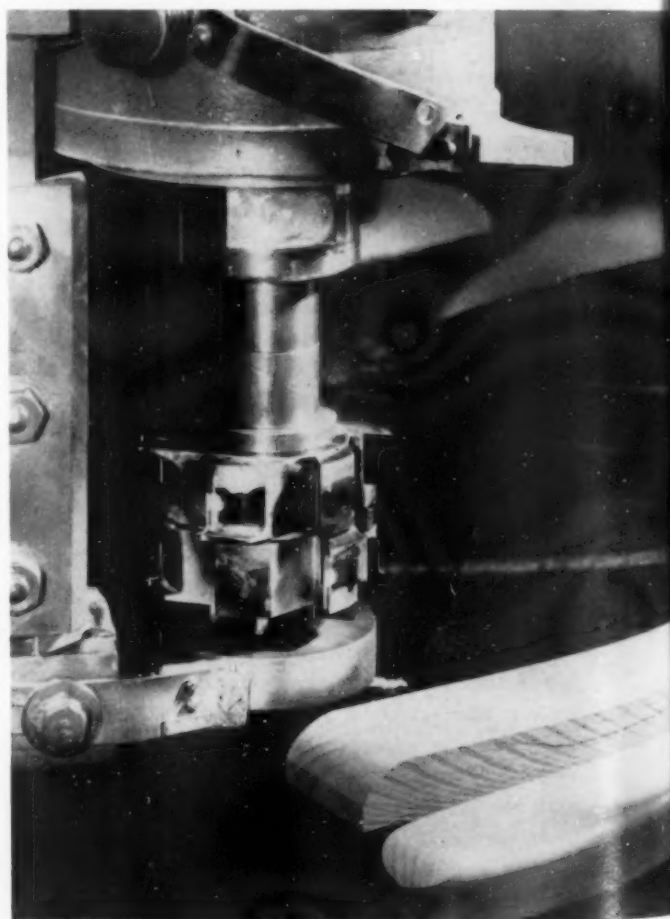
Photo—Courtesy Carbology Dept. G.E.

honing is not generally necessary for woodworking tools, this cutter is honed once between grinds to improve the finish produced on the workpiece.

In many applications, saws tipped with cemented carbide are relieving production bottlenecks. For instance, in one case steel-toothed saws were sharpened every four hours and frequently the teeth were damaged by stones and mineral deposits in the wood. Carbide tipped saws now run four months without grinding, mineral deposits and stones having no effect. Further, the facing produced is so smooth that 80 percent of the wood sawed can be joined without planing.

In the use of carbide tooling, proper modification in tool design is important to successful application. This is far more extreme than that required for metal-cutting. Woodcutting tools, designed to cut with the least possible resistance, utilize the smallest possible included angle at the cutting edge to increase the shear characteristics. The shearing action is more important for cutting than the ability of the tool steel to hold a keen cutting edge. Clearances are not critical, consequently they are large on many woodcutting tools.

A typical steel knife for cutting dry, soft pine has an included angle at the cutting edge of 20 degrees, which gives a high shearing action. The



Photo—Courtesy Carbology Dept. G.E.



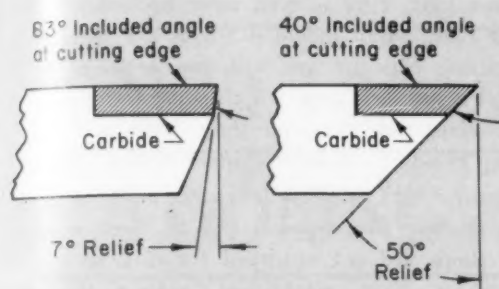


Fig. 5. (left) Typical metal cutting tool showing 83-degree included angle and 7-degree relief angle in comparison with typical woodcutting tool (right) with 40-degree included angle and 50-degree relief angle.

first cut dubs off the keen edge and continued cutting depends on the shear action of the knife. If a carbide tipped knife of similar design is used for this application, the hardness or edge holding capacity of the carbide would resist the dubbing effect and the knife edge would be maintained considerably longer. A 20-degree included angle on carbide, however, is impractical from a strength standpoint, hence shear action is sacrificed by increasing the included angle because of the edge holding capacity in the carbide. Even so, the resulting wear ratio of cemented carbide to steel wood cutting tools is accepted conservatively as 50 to 1. A typical carbide tool for woodworking is compared in Fig. 5, to a similar tool with clearances for metal cutting.

Finish and feed speeds are controlling factors in wood parts production. Fine finish at high speeds requires multiple cutters and to secure satisfactory results all cutters must be exactly in the cutting circle.

No 6 to 8-inch diameter cutter assembly can revolve at speeds of 3600 to 7200 rpm with all

Table 2—Recommended Finishes for Various Woods

Kind of Wood	Knife Marks (per inch)
Ash	11 to 14
Basswood	8 to 12
Beech	12 to 14
Birch	12 to 14
Cedar	8 to 12
Cherry	12 to 14
Cottonwood	8 to 12
Cypress	8 to 12
Fir	8 to 12
Gum	9 to 13
Hickory	12 to 15
Mahogany	12 to 16
Maple	12 to 14
Oak	12 to 14
Pine	9 to 13
Poplar	9 to 13
Redwood	8 to 12
Spruce	8 to 12
Sycamore	11 to 14
Walnut	12 to 14

knives remaining in the cutting circle. One knife will reach out and become the sole finishing knife, giving a washboard surface. After grinding, high speed steel knives may be jointed by passing a stationary stone across the head while it is running at top speed. This process back bevels each knife until all show a highlight at the cutting edge. Then are all of the knives in the cut. No successful method, however, has been devised to joint carbide cutters.

Grinding and jointing operations for steel multiple knives apply to speeds of 3600 to 4800 rpm. When high-frequency current is used to attain spindle speeds of 5400, 6000 and 7200 rpm, one-knife finishing and one-knife cutting to balance the heads are employed. Carbide can be used successfully for these cutters because the need for jointing the knives is obviated and the long life advantages of carbide is gained. With only two knives, however, the higher feed speeds cannot be obtained. TABLE 1 explains the relationship of feed speeds to number of knives and head speeds. Knife marks properly spaced are the key to fine finish. Finishes as recommended vary according to the species of wood. TABLE 2.

Finer finishes up to 20 knife marks per inch are often desired and obtained, mostly on hard woods.

The high operating speeds of carbine tipped woodworking tools mean that the brazing operation, Fig. 6, must be perfect. A carbine tip breaking loose from a tool turning at 7200 rpm can be very hazardous. Much work has been done to insure a good braze line and today it is rare that a tip comes loose because of poor braze line. An example of the meticulous care required is indicated in an instance involving braze failures. Thorough investigation disclosed that the operator doing the brazing had an excess acid condition. In positioning the tips with his fingers, he placed a film on the tip that resulted in a poor braze. This problem was eliminated by having the operator position all cleaned tips with tweezers.

In the metals field, carbide producers and tool

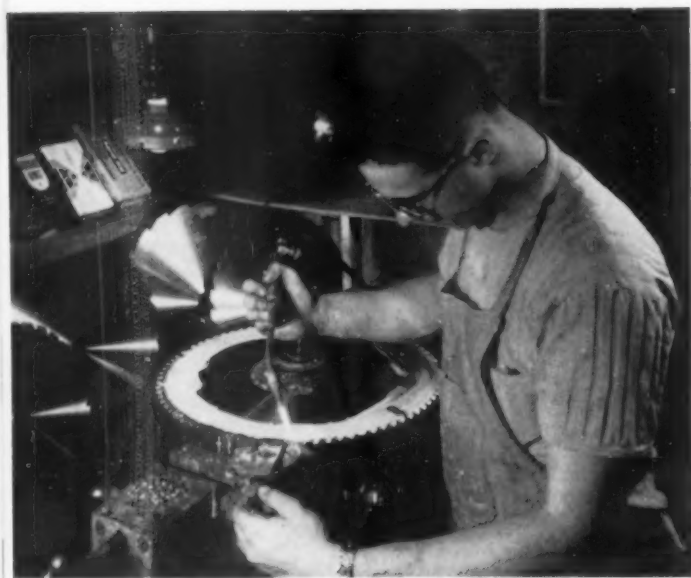
Table 1  
Spindle Speed and Feed Rate for Knife Cuts per Inch\*

Knife Cuts per inch	Spindle Speed (rpm)			
	3600	5400	6000	7200
	(ft.)	(ft.)	(ft.)	(ft.)
8	36	54	61	73
10	30	45	50	59
12	25	37	41	49
14	21	32	35	42
16	18	28	31	36
18	16	25	27	32
20	15	22	25	29

\*Figures given are for one knife. Multiply number of knife cuts wanted by figure shown by number of knives and divide into spindle speed for rate of feed in feet. Figure as one knife any head not jointed regardless of number of knives in it.



Photo—Courtesy Carbide Dept. G.E.



Photo—Courtesy Carbide Dept. G.E.

manufacturers are constantly cautioning the user about the care needed in grinding carbide tools. In woodworking, care is even more necessary because the cutting-tool included angles are reduced at the cutting edge by one half, as illustrated in Fig. 5. Proper grinding wheels and techniques must be employed to grind these tools without generating grinding cracks or chipped cutting edges.

It requires high quality precision grinding to properly sharpen these blades, Fig. 6. Most wood working shops are not equipped for this, so saw manufacturers have established service shops. Under the present system it is necessary to ship the blades to these service shops. Unfortunately, these are few and far between, being located only in the heavier wood products producing areas. More of these service shops will be set up in the near future, but the present situation is an obstacle to adaption of carbide for woodworking.

Without question, carbide cutter acceptance in the woodworking field is in its early stages, but it is far enough developed to call for the full cooperation of all interested industries, a definite knowledge of each other's problems and participation in the development of carbide usage. No doubt all can profit from the experience of the metal working field with carbide tools because of the many parallels evident.

Fig. 6. (top) Sharpening and side grinding carbide-tipped saw for woodworking applications.

Fig. 7. (bottom) Brazing carbide tips on a woodworking saw.

## Uniformity for Diamonds

**T**OOL ENGINEERS, machine tool builders, industries using diamond tools, engineering societies, the diamond trade and the Armed Forces have collectively recommended a standardization project be set up under the procedure of American Standards Association. Objective of the move is a more effective use of industrial diamonds as a vital element in defense production, and it will aim at interchangeability of diamond tools and their holders.

Scope of the work to be undertaken was tentatively outlined to cover terminology and definitions applying to loose diamonds and diamond tools, and dimensions of diamond tools and tool holding accessories. According to Vice Admiral G. F. Hussey, Jr., managing director of the ASA, who announced the conference results, "Such a large variety of diamond tools and holders have been developed over the years that there is no interchangeability between these parts." A remedy for this situation

would eliminate the present necessity of stocking a large number of different replacement parts.

"Industrial diamonds plan an important part in mass production, and their conservation is essential if industry is to continue without disruptive delays. They are used as cutting tools, for example, in turning and boring operations, and also in devices for truing and dressing abrasive wheels."

The American Society of Tool Engineers, which requested the ASA to consider the problem, offered to assume the administrative responsibility as sponsor for a project to be initiated under ASA procedure.

The Industrial Diamond Association of America agreed to join in this responsibility. The conference recommended that the two groups be invited to accept joint sponsorship of the project and to organize a committee to develop standards in this field.

# SPAR MILL TOOLING

By James M. Stolz\*

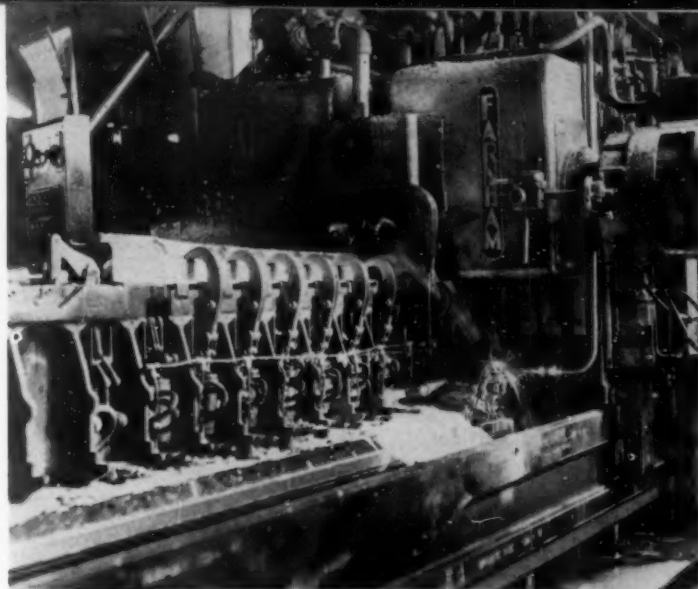
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**M**ACHINING AIRCRAFT SPARS, cap strips and similar long extruded parts poses unusual tooling problems. One of them results from the extensive bed lengths required. How can a 40 foot spar of varying contour be held for milling to a few thousandths accuracy? For this purpose, several types of fixtures and work holders have been designed to solve specific needs. Their application, of course, depends on the features of the machine employed.

The well known spar milling machines, *Figs. 1 and 2*, have been developed solely for the purpose. Bed length of the machine is dictated by the longest spar that the company expects to produce. Because of the numerous changes in contours of the parts to be milled, the cutter heads must be articulated to move in one or more directions during the progress of the cut. Profile templates, *Fig. 2*, attached to the side of the machine guide the cutting head by means of the template follower. Two or four bladed carbide tipped cutters with a diameter from six to twelve inches are used. The size is determined by the surface finish required and the available space from the bottom of the cut to the highest clamp that might interfere with the arbor.

Mill fixtures or workholders for holding the part in position on the machine fall into two major groups: the first uses hand (wrench) operated clamps to hold the part secure, *Fig. 4*, and the second utilizes hydraulically operated clamps, *Fig. 6*. Advantages of each type will be seen from the discussion of the design of the work-holders.

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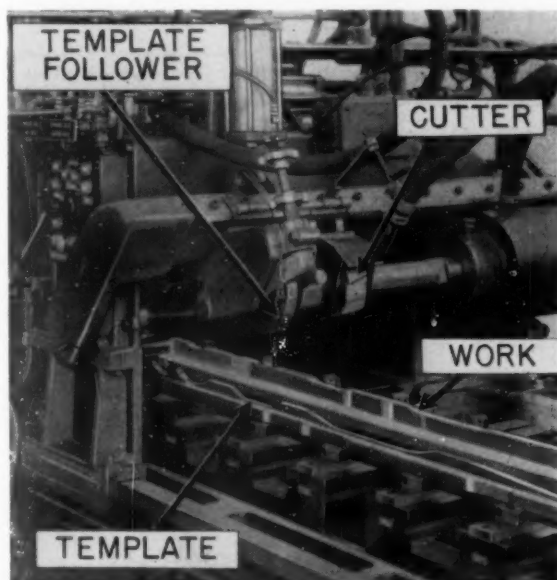


**Fig.1.** Hydraulic clamps holding an extrusion for milling. Some clamps have swung out of the way of the approaching cutter head.

Because of the varying shape of the spar, the fixture must be carefully analyzed to support the part as much as possible along its entire length and yet allow clearance for cutter, arbor and machine carriage as they pass over the spar. There should be a minimum of pivot points, lever arms, bell cranks, etc., since chips would tend to work their way into the mechanisms preventing their free movement.

Planning the sequence of operations to be performed by the spar mill in producing a part calls

**Fig. 2.** Relation of template, work, template follower and cutter can be clearly seen.





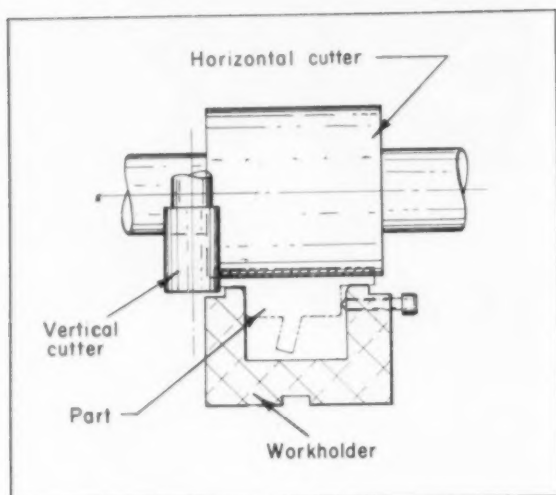


Fig. 3. Setup using both horizontal and vertical cutters to finish the base and one side of a spar in a single pass.

for intimate familiarity with the action of the machines. It is quite often done by the tool design group itself instead of by the planning group as in conventional practice. The reason for this is that the limiting factors of space, special cutters available, and many other problems usually cannot be resolved until the part is laid out on the design board and the general mill fixture configuration determined as the cuts are planned.

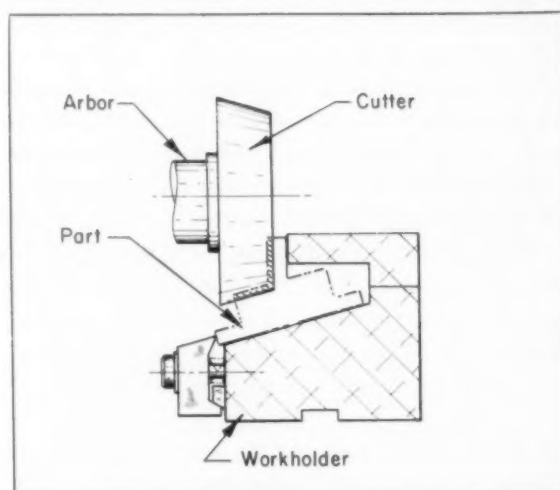
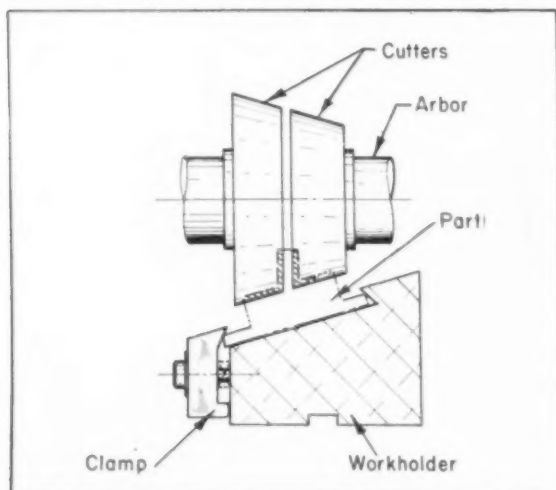
The first step in machining a spar is usually to finish the base of the extrusion and an edge to be used throughout subsequent operations for locating purposes. Since the Spar milling machines have several cutting heads more than one cut may be made at one time. In Fig. 3, the bottom of the part is being cut with a slab mill and the edge with a vertical cutter. The clamps are simply cone point cap screws. As the clamping surface will have a heavy cut removed later, there is no concern about marring the part with the clamp screws in this set

up. Some companies use a type of hydraulic "flying" clamp to hold the part. As the cutter approaches, an arm attached to the moving carriage actuates a valve attached to the hydraulic cylinder ahead of the cutter and causes it to swing the clamp out of the path of the approaching cutter. Another arm located behind the cutter on the carriage closes the valve after the cutter has passed, causing the clamp to swing into position again, Fig. 1. One of the objections to this clamp is that, should chips get into the valve mechanism, it will not operate. Then if the operator fails to stop the machine in time, the cutter will hit the clamp ruining the cutter and possibly bending the spindle. Sometimes, however, these clamps present the only practical way of machining the surface of a thin part that cannot be held from the side without marring or buckling it.

The part holding fixtures themselves are usually aluminum or kirksite and vary in length from 18 inches to five feet. The length of the workholders is ordinarily determined by the method used to machine the fixtures. For example the toolroom may desire to machine the fixtures on universal mills with a carriage capacity of some three feet, which would limit the fixture length to that size. If the fixture clamps are located on nine inch centers along the length of the fixture its length would be some multiple of this dimension 36 inches, for example. Weight must of course, be considered in determining the length of the individual fixtures. Those five feet in length must be loaded onto the machine by a crane and all tool room operations would call for a handling rig.

Sometimes it is the practice to leave 0.010 to 1/16 inch of stock on the locating surfaces of the fixtures to be removed by the spar mill machine itself at the tool trial, thereby insuring accurate parallelism of the locating surface of the fixture with the ways of the machine. The sub-bases on which the mill fixtures will rest cannot be machined separately, truly

Fig. 4 (left). Straddle milling setup which gives greater accuracy than tooling arrangement in Fig. 5 (right).



parallel with the machine ways, so the bases are sometimes machined with the spar mill's own cutter or a grinder attached to its carriage at the time of installation. The cutter path must be parallel with the locating surfaces of the fixtures as the tolerances of present day spars are insufficient to allow for error between these surfaces.

When finishing a narrow fin, *Fig. 4*, it is advantageous to straddle mill the part, because cutting one surface at a time as in *Fig. 5* increases the tolerance to which the fin thickness can be held, as well as creating vibration in the vertical surface during machining. However, it is sometimes impractical to do both cuts at once and, if so, the part is usually located on the side of the fin away from the cutter, *Fig. 5*, to avoid any tolerance buildup between this surface and the cutter, such as would inevitably occur were the part to be located on the lower ear surface.

Hydraulic clamps are particularly advantageous over hand clamps from a time standpoint. The length of time it takes to cut a 40 foot spar with the cutter traveling at a nominal 100 inches per minute allowing for approach time, would be six minutes. With a clamp every nine inches there would be 54 clamps on the fixture. Allowing about  $\frac{1}{2}$  minute to position and tighten each clamp it would take one man a half hour to clamp one billet in position for cutting, and a somewhat lesser time to unclamp the part. Hydraulic clamps are actuated almost instantaneously thereby eliminating clamping time, so up to six times as many spars can be cut with hydraulic clamps as with conventional hand clamps. Some fixtures also provide hydraulically operated "hold-down" clamps to insure accurate seating of

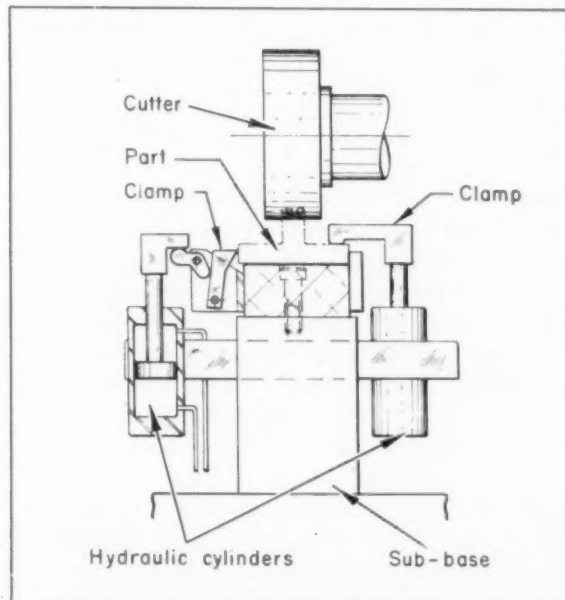
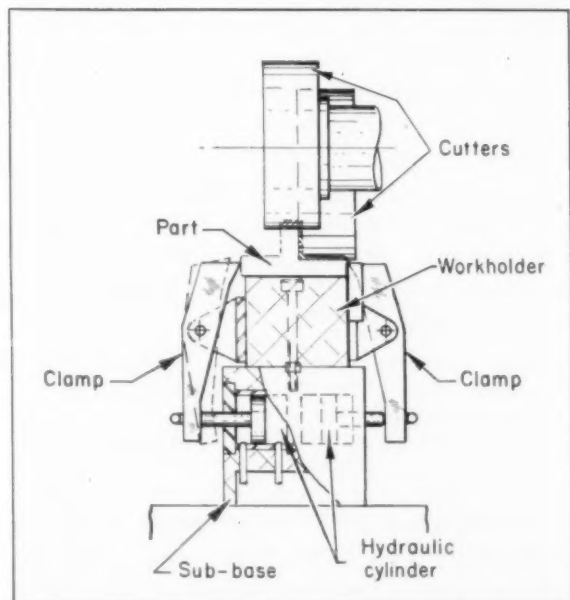
the part in the fixture; the part is held for the cut by side clamps after which the hold-down clamps are released.

The basic installation and design of hydraulic fixtures must be done with extreme care if they are to be used on future aircraft programs. The cylinders themselves are installed in some type of a sub-base. An installation that houses the cylinders within the sub-base with clamps attached to the fixture or workholders is shown in *Fig. 6*. This type of installation is good because all hydraulic lines, valves etc. are within the sub-base and protected from chips and coolant; however this type is more difficult to adapt to future fixtures and to parts that may vary considerably in width than the type shown in *Fig. 7*.

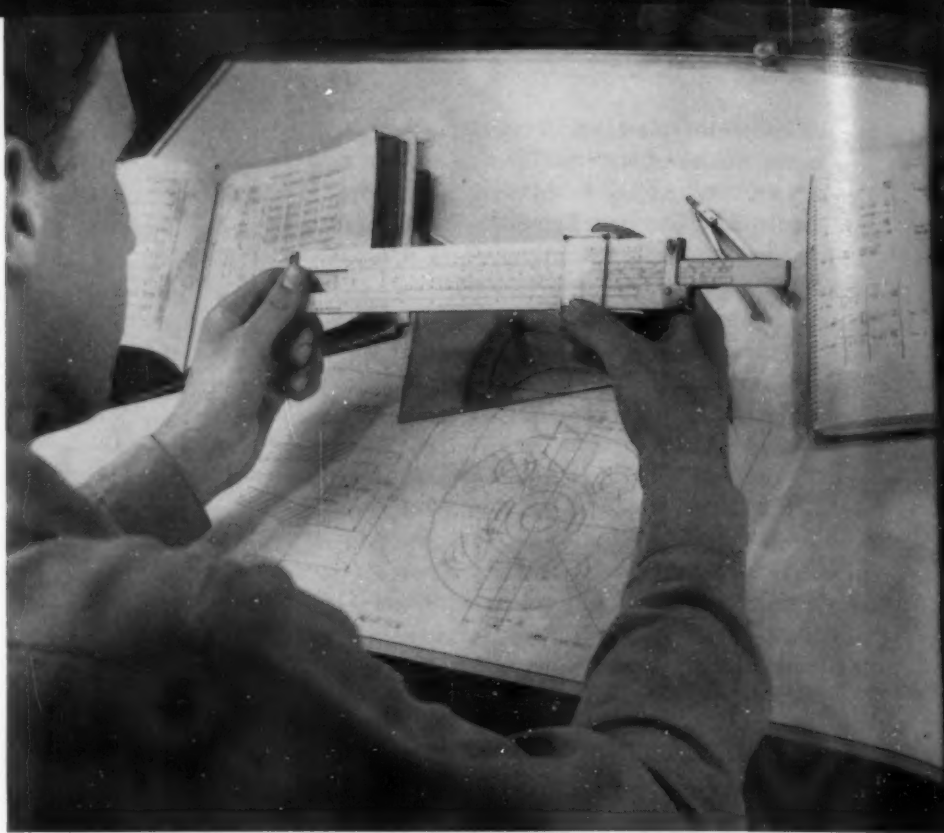
The type in *Fig. 7* provides a flexible arrangement since the hydraulic cylinders are adjustable to accommodate varying widths of fixtures. The clamps are attached directly to the cylinder or to the fixture. The objection to this type is that all parts are exposed to chips and attendant dangers mentioned previously.

Spar mills are used by some aircraft companies solely for high production machining of large extrusions or billets while others schedule production runs of smaller parts as well. Many types of aluminum fittings can be machined from standard extruded shapes with perhaps ten or twelve parts being cut from a single 15 foot piece after all cuts possible are run on the spar mill. The versatility of these machines provides a never ending challenge to the tool planner from the standpoint of milling other aircraft parts, utilizing the speed and size of these machines to increase production.

**Fig. 6 (left).** Hydraulic clamp installation with cylinders in sub-base, and **Fig. 7, (right)** cylinders attached outside.



Tool designing is one of the jobs a technician can perform after he has acquired industrial experience.



## Technicians in Tool Engineering

By William W. Rogers\*

Head, Dept. of Mechanical Technology  
Long Island Agricultural and Technical Institute

THE ROLE of the technician in tool engineering is essentially that of an engineering aide. In the tool engineering field he can be trained to enter industry in jobs which will lead to such positions as tool designer, tool and die maker, methods analyst, inspector, test technician, laboratory assistant, salvage technician, quality control assistant, specifications writer, purchasing agent, or expeditor, to name a few. Non-engineering graduates from technical schools are known to be employed in such positions. In New York State, the State University of New York has nine two-year technical institutes offering training to high school graduates in a program of mechanical technology. At the institute

in Farmingdale, at least half the graduates enter one of these positions in the field of tool engineering.

In the study of positions, which technically trained persons might fill, a series of questions will logically be asked:

1. What general knowledges, such as communication skills, sociology, economics, human relations, etc., does this job entail?
2. How much mathematics and science is necessary? How frequently is analytical geometry and calculus used? How much should the student know about metallurgy, applied mechanics, dynamics, hydraulics, and strength of materials?

\*Senior member ASTE Long Island Chapter





Industrial experience for the technician will enable him to perform such tasks as that of tool and die maker.

3. How extensive should be his knowledge of manufacturing processes?
4. What should he know about drafting, descriptive geometry, tool design, machine design?
5. How important is a knowledge of business organization, production planning, manufacturing analysis, time study, and quality control?

A study of the activities in known positions is the primary element in undertaking to learn what a technician should know. This alone is usually not enough, for there are promotions for technicians as well as engineers, and provisions should be made for such a step. Thus, a thoroughly comprehensive study will usually indicate that a technician will fill a job which has these criteria:

1. It is a vocation which requires a high degree of specialized knowledge together with a broad understanding of operational procedures.
2. It involves the frequent application of personal judgment.
3. It deals with a variety of situations.
4. It often requires supervision of the work of others.
5. It opens to the worker opportunity to develop an ever increasing personal control over the application of his knowledge to his work.
6. It usually requires a few more skills than a trade and less generalized knowledge than a profession.

In setting down positions which should be studied with the aim in mind of analyzing them for techni-

cal skills and knowledges, a cluster can be made of some of the typical jobs which might be found in this field. The jobs in this cluster are in three categories: training or entry, intermediate, and terminal.

Training or entry jobs are those which the graduate of the technical school has been prepared to enter. His training has been broad, but still has been sufficiently concentrated for him to enter one of these jobs, and earn his way.

Intermediate jobs are those which the trainee will, on application of his knowledge, improvement in his skills, and with maturity, reach in a period of development. Most technicians will tend to reach this field and become established in it.

Terminal jobs are those regarded as the ultimate in this field, which might be reached by an outstanding few with superior ability.

Technical jobs in tool engineering which exemplify the training or entry category are apprentice tool designer, draftsman, test technician, parts inspector, production clerk, machine operator, computer, laboratory technician, service technician, and in-plant instructor.

The intermediate type of job includes tool designer, methods man, methods analyst, production controller, quality control technician, estimator, tool and die maker, tool manufacturer, material specialist, job analyst, production engineering liaison, employment interviewer, and salesman.

The terminal or more advanced type of position might be that of production manager, chief tool designer, chief inspector, purchasing agent, machine tool superintendent, personnel manager, or equipment salesman.

When these positions have been analyzed for actual educational content, a study can then be made of the actual subject matter to be introduced into a curriculum. It is possible, depending upon the amount of skill desired, to range between technical programs of several hundred hours and several thousand. It is possible, in a technical program, to give the student in class and laboratory between 25 and 30 hours of work a week, and in a normal school year there are approximately one thousand hours. In New York State, the technical institute programs run for two years.

The technician in tool engineering requires, as indicated previously, a broad program. Such a program for meeting the needs of a technician or student is itemized in the following list. The subjects are indicated for twelve-week sessions. In parentheses are indicated the hours per week they occur.

1. General Education
  - General education I, II (3) (3)
  - Communication Skills I, II, (3) (3)
  - Modern community I, II, (3) (3)
  - Human relations (2)

- Psychology (3)
- Public speaking (3)
- Business organization (2)
- Accounting (3)
- Personal and community health (3)
- 2. Basic Technical
  - Mathematics I, II (4) (4)
  - Analytical geometry (3)
  - Physics I, II, (5) (5)
  - Industrial materials and processes (4)
  - Mechanical drafting I, II, (6) (3)
  - Descriptive geometry (4)
- 3. Technical
  - Machine tool laboratory I, II, III, IV (7, 7, 7, 7)
  - Tool design I, II (7) (7)
  - Strength of materials (5)
  - Precision inspection (4)
  - Mechanical design I, II (6, 6)
  - Manufacturing analysis I, II (8) (5)
  - Metallurgy (6)
  - Time study and estimating (4)
  - Production planning and plant layout (4)
  - Senior project (4)

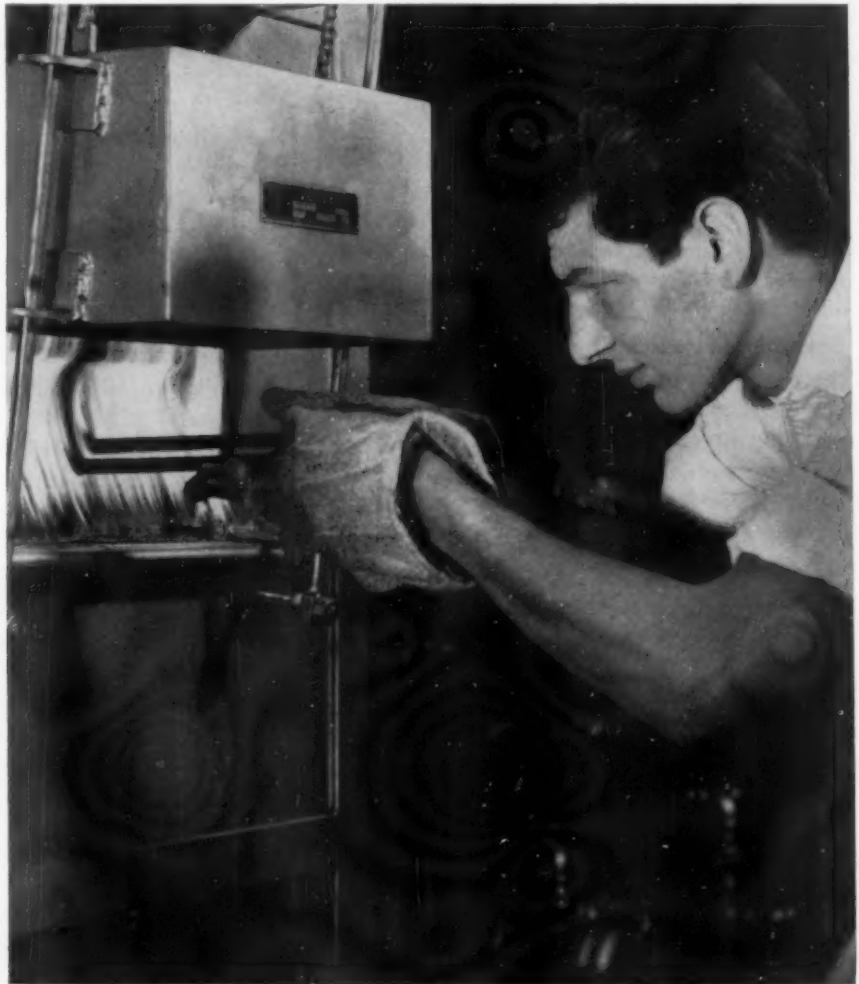
In this breakdown of hours, classroom and laboratory hours have been shown combined. A study of the curriculum will indicate that the broad field of tool engineering has been covered,

and elements are contained which will enable the technician to feel useful in the engineering field.

The development of student groups of the ASTE in New York State has taken place in the two-year institutes. The need of the student at this time for broad knowledges, factual information, and understanding of methods used in this profession are fostered by these student chapters. High on the list of necessary texts and handbooks in this field is the *Tool Engineers Handbook*. Since its publication it has been found so necessary on the program at Farmingdale that it is purchased by all students as a required text and reference.

The strongest aide to the tool engineer is the well-trained technician who can carry out ideas, transform them into reality, and make his contribution to the field in terms of tangible structures. The training of the technician is an essentially real form of training. The laboratory of a technical institute is usually as well equipped as the engineering school. The technician is essentially a user of equipment, knowledges, and skills to produce a desired result, whether it be a test, drawing, part, report, or a result.

Technicians can relieve engineers of much detail in the laboratory.





# QUALITY CONTROL in Practice

By John W. Greve

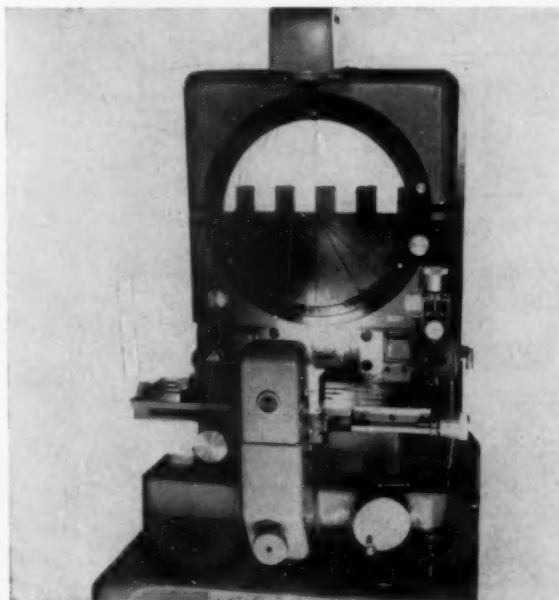
**P**HENOMENAL RESULTS obtained with quality control of the manufacturer of ordnance components has inspired The Hoover Co. in North Canton, Ohio, to extend its program to the production of household appliances. In the manufacture of one component part, having over fifty variables, rejects have been reduced to less than two percent. At the start of the program, rejects had been as high as 90 percent. As many inspectors as operators were required to produce parts within tolerance specifications.

Because the program has been so effective, both management and production are as enthusiastic as the inspection department in the application of quality control methods in the plant. Instead of employing go and not-go gages, optical comparators and indicating gages, *Figs. 1 and 2*, are used by the machine operators, giving them the same methods of precision measurement available to the inspection department. With these gages over-all savings and closer control are being achieved. Also, with the indicating instruments, the exact amount of deviation or measurement within the tolerances is possible. This is advantageous in an effective quality control program.

Previous approaches to quality control methods have not been readily applicable to medium production schedules. The method developed at Hoover, however, is a practical program with a minimum of mathematics and is understandable to every machine operator. Adaptations of the new system will

be employed in the punch-press and screw-machine departments and also will be available to all other departments. These include zinc and aluminum die casting, plastic molding, motor winding, brush making, assembling and other operations involved

**Fig. 1.** An optical comparator measures the height of protrusion on a litter picker and is utilized extensively to obtain data for frequency distributions.







C. Gordon Troxler, vice president of The Hoover Co., has been instrumental in bringing the company's various inspection departments together, reorganizing them, and raising their status to a separate division. Formerly they had reported to various production groups. Under his guidance, the company has devoted particular attention to statistical quality control, and started development of the program discussed in this article. In his present capacity, Mr. Troxler is responsible for production, inspection, traffic, and purchasing for the company.

in the manufacture of a domestic appliance.

Several attempts at starting a quality control program were instituted before the present system was evolved. In 1949, inspection was divorced from production and was placed directly under the vice president in charge of manufacturing. Previously, the production department was interested primarily in the quantity rather than quality of parts manufactured. By the time an inspector rejected parts for exceeding tolerances, a large quantity usually would have been produced to the same dimensions. Machine operators had few gages and, in most cases, the incentive did not exist for the operator to produce parts to blueprint specifications.

**Quality Control Program:** In 1950 an entirely new quality control program was instituted and

from this start the present plan, which has proved so successful, was developed. Starting with two engineers under the direct supervision of the chief inspector, the section now has a staff of 20, including technicians and clerks for operations in the entire company.

Without any preconceived ideas about instituting a program, Hoover's quality control engineers visited many plants employing successful and proved methods. Each system was carefully analyzed and compared so that the best features could be incorporated into Hoover's plan. The system evolved is easily understood by the shop personnel. Two fundamental techniques form the basis of the new system. They are process analysis and control sampling.

In a process analysis, the capabilities of a pro-



**Fig. 2.** Fast and accurate gaging equipment, capable of measuring in extremely small increments is required both in the checking laboratory and in the shop.

duction machine are determined by analyzing 120 consecutive pieces produced by the machine. Actual readings are taken of each dimension in question. If the specifications have tolerances of 0.001 inch, readings are taken to 0.0001 inch. These data are plotted in the form of frequency distributions to obtain the natural variation of the machine. In most cases where a high percentage of rejects were causing production difficulties, it was found that the natural variation of the machines made them incapable of producing acceptable parts. When the problem involved automatics, each spindle had its own pattern of variability. In each case, after the machine was rebuilt, the variation was brought within the required tolerance, Fig. 3. Subsequent checks made periodically showed distributions having the same shape.

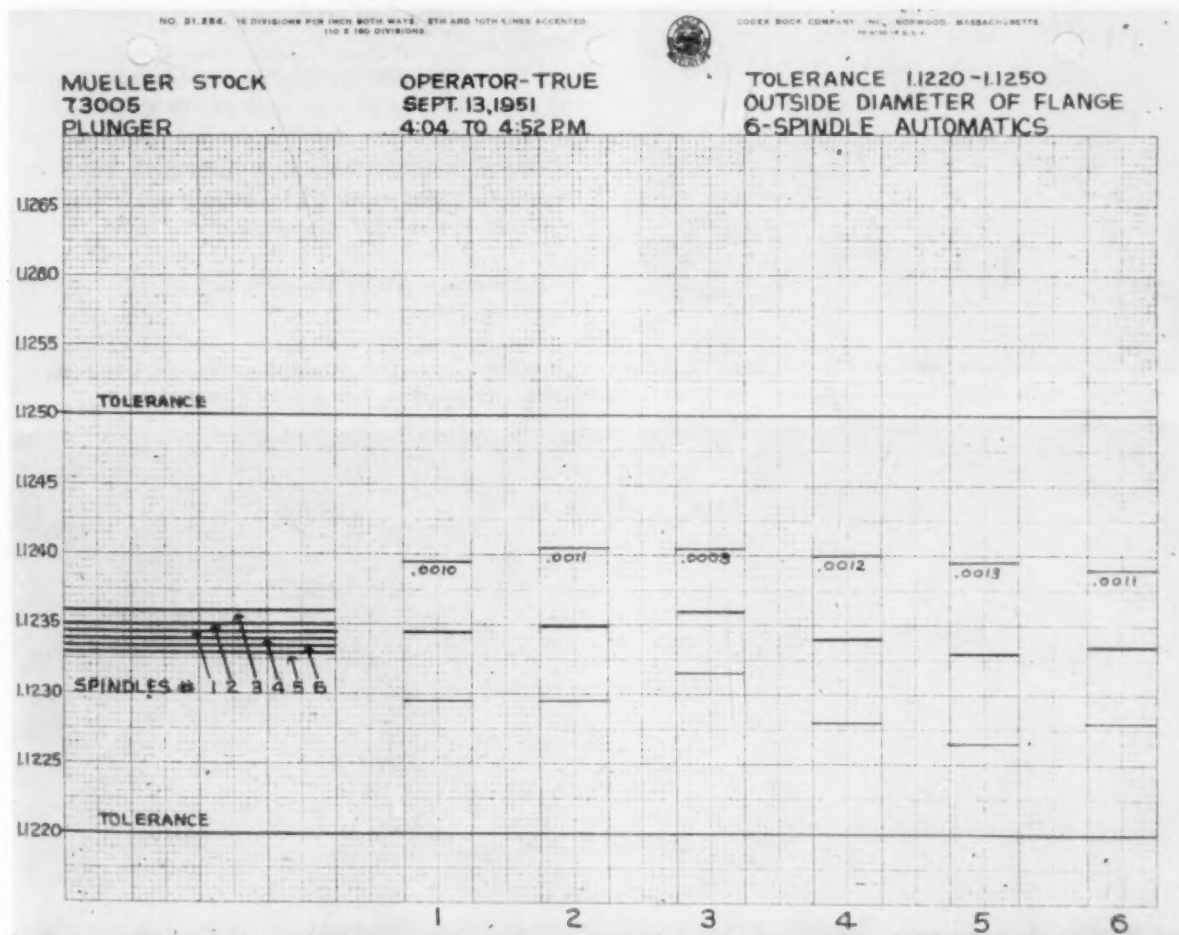
Because of the encouraging improvements in production, the section expects to perform analyses on all shop processes. Conferences with the engineering department on a "give and take" basis will determine acceptable tolerances for various parts

and the equipment capable of producing each part. With this approach, rejects will be minimized and the results obtained in special cases will become the standard for the entire plant.

For control of quality of parts, control charts are seldom used. They are useful laboratory tools and are employed by the quality control section for difficult jobs but have been used sparingly in the shop. The control charts for average and range values require considerable understanding before they are effective tools. Rather simple frequency-distribution charts, such as shown in Fig. 4, are employed because they show graphically in easily understood form exactly what is happening.

Before applying quality control, one part, having 23 quality characteristics, was being produced on automatic screw machines with defects accounting for 30 to 40 percent rejects. Now, the new program involves taking 25 samples out of 160 parts and charting daily and weekly summaries to show which operator, machine, and shift are producing defectives, Fig. 5. As a result, rejects on this opera-

Fig. 3. Separate spindle analyses of a six-spindle automatic. A further breakdown of a frequency distribution of the machine reveals the average setting and variability of each spindle.



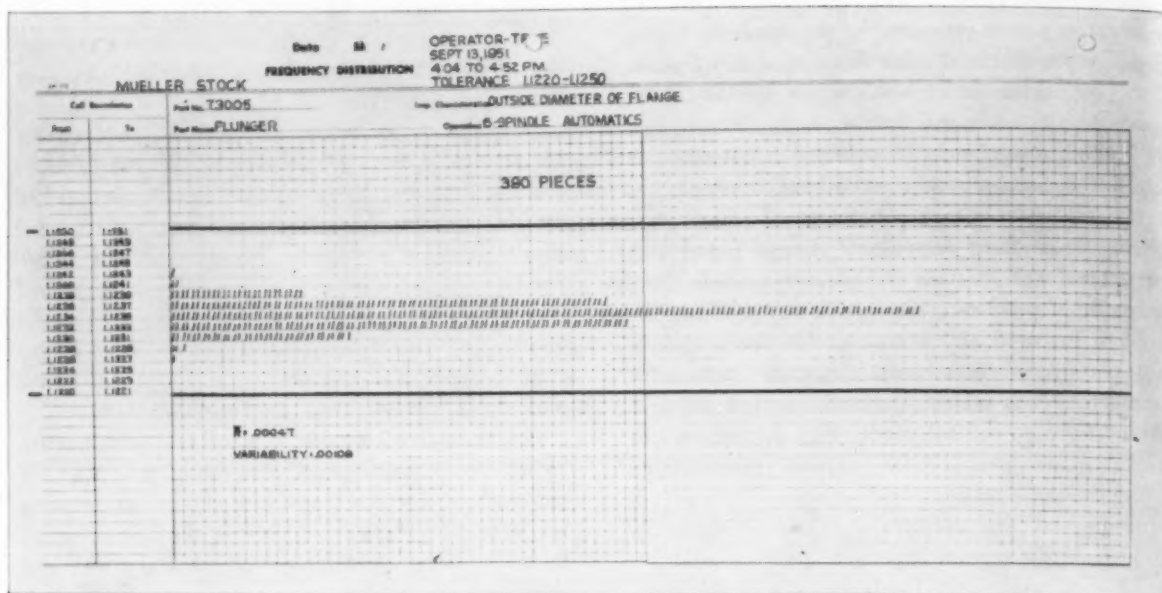


Fig. 4. Frequency-distribution chart of a process analysis is a major tool that is easily understood at all levels of factory employment.

tion have dropped below 0.5 percent.

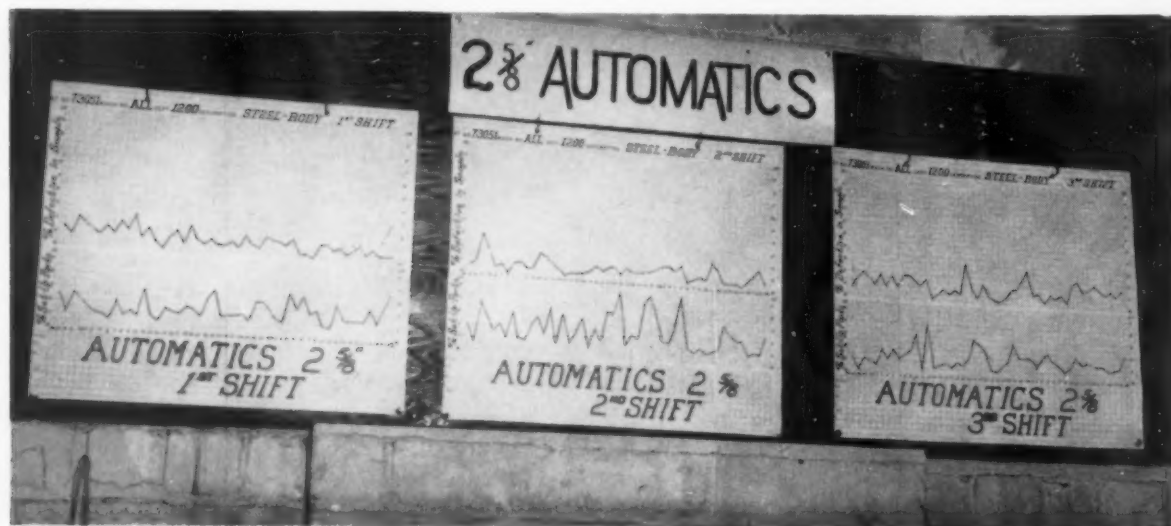
To improve production, management establishes quality targets for supervisors, Fig. 6. For example, a target of 10-percent rejects was the goal on a critical part. Performance quickly met the goal and continued to improve until the previously impossible 0.5 percent rejection was met and bettered. Reducing rejects from a high of 40 percent, however, cannot result from a program alone, however good. It also requires the enthusiastic support of everyone involved. This is being obtained through actually demonstrating the practicability of a

theoretical approach, interpreting it in terms understandable to all, and giving credit for cooperation and performance to each machine operator and his supervisors.

On another operation, involving a Kingsbury and an automatic for producing a part with 46 quality characteristics, the quality control program has provided the information and stimulus which reduced the total rejects consistently until they are currently below 1.5 percent.

**Education Aids:** Because any effective quality

Fig. 5. Posting of percent-defective charts for each machine operator establishes an environment whereby individuals become quality conscious and creates an incentive for quality competition.







**Fig. 6. (Top)** Inspection, purchasing and production management personnel reviewing status of quality and determining quality goals for future production.

**Fig. 7. (Center)** Operator inspects parts to evaluate quality of the next lot. Trays are provided for known defectives, setup parts and other questionable parts. Sample lot sheet hung on the machine indicates graphically the effectiveness of his work.

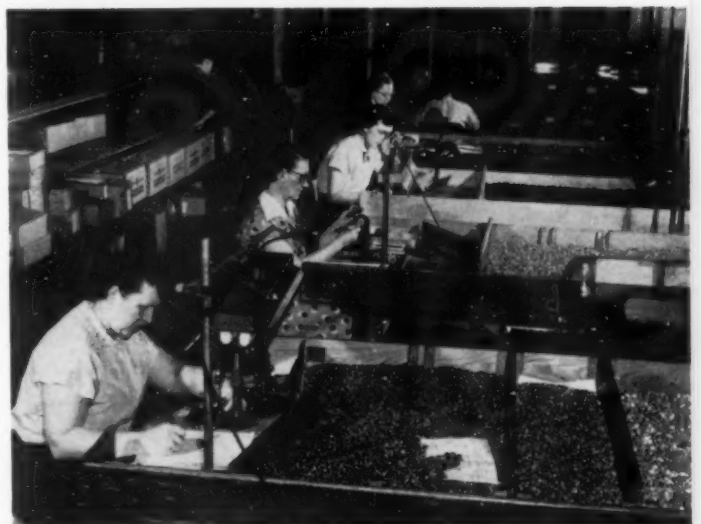
**Fig. 8. (Bottom)** Lots are dumped to enable random sampling of each in receiving inspection and in other sampling areas of the plant.

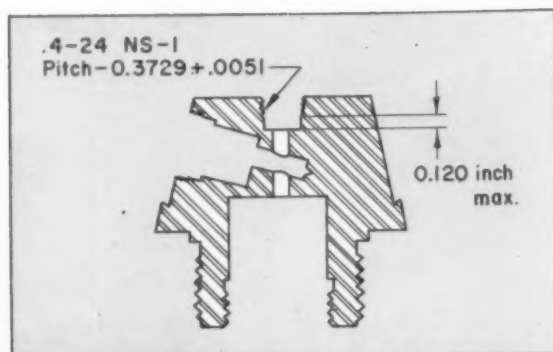


control program requires an organized method of explaining the basic program in an understandable manner, an extensive educational program has been instituted and is augmented by all available methods to keep the shop personnel informed as to the progress and achievements accomplished. The educational program is one of the major functions of the quality control program, demonstrating the effectiveness and utility of the techniques employed.

This educational program includes giving a series of formal talks and demonstrations to all groups of personnel including engineers, production operators, inspectors, production supervisors, purchasing personnel, tool and die designers, tool and die makers, and others. Through understanding of the system and enlisting the cooperation of everyone involved, each individual becomes a part of the program and feels responsible for its effective operation.

Scrap boards are prominently displayed in each department dramatizing scrap costs in terms of the





final products. In addition, a scrap report is issued periodically to production and inspection supervision. Also charts showing percent defective parts produced by each operator are displayed on department boards, creating a competitive environment whereby individuals become quality conscious. This stimulates the desire to do a good job that exists in all of us.

Targets for quality goals are determined in regular meetings of inspection, purchasing and production management so that all may work toward the same objectives, Fig. 6. As operators meet these goals, management gives the credit where it is due.

Fig. 9. (Top) Steel body showing tolerances on thread and depth of hole that gave considerable trouble before quality-control methods were employed.

Fig. 10. (Center) Inspection of samples to control the processes shown in the background and to obtain information for production and inspection supervision. At all times the quality picture of both the machines and the operators is known.

Fig. 11. (Bottom) Lot sheet for inspecting coded dimensions of a part.

Kingsbury		Lot Sheet 73051 Body		THE HOOVER COMPANY NORTH CANTON, OHIO		Kingsbury	
Code No.	Dimension	Description	Code No.	Defects + -			
1	.224 ± .005	Diameter of interrupter cavity	1				
2	1345 ± .020 @ 15°	Location of interrupter cavity	2				
3	.015 off center	Alignment of flash hole & interr. cavity	3				
4	.170 ± .015	Depth of interrupter cavity from center line	4				
9	.3729 ± .0051	Pitch diameter of flash tube thread (MIN)	9				
51	.3729 ± .0051	Pitch diameter of flash tube thread (MAX)	51				
41	.124 ± .011	Diameter of flash hole (MIN)	41				
67	.124 ± .011	Diameter of flash hole (MAX)	67				
42	.5411 ± .0062	Pitch dia of setting sleeve retainer thds (MAX)	42				
43	.080 MAX	Depth under setting sleeve retainer thds (MAX)	43				
44	.437 ± .005	Diameter of setting sleeve cavity (MAX)	44				
45	.410 ± .010	Depth of setting sleeve cavity (MAX)	45				
46	1.062 ± .012	Con. of delay plunger cav with flash hole	46				
47	Visual	Setting sleeve retainer threads not full	47				
52	.3549 ± .0045	Minor Diameter of flash tube thds. (MAX)	52				
63	.3549 ± .0045	Minor Diameter of flash tube thds. (MIN-Func)	63				
53	.110 Max/270 MIN	Depth of perfect flash tube thread (MIN)	53				
58	1.575 ± .020	Depth of flash tube cavity	58				
64	.3549 ± .0045	Diameter of flash tube pilot cavity (MIN)	64				
69	Visual	Flash tube threads not full	69				
			Total Defects				
K	.050 ± .010	Alignment of setting sleeve & interr. cavity	K				
N	.535 ± .010	Depth of interrupter cavity	N				
P	.437 ± .005	Diameter of setting sleeve cavity	P				
S	Unlisted	(Write in)	S				
			Total Defects				
Lot No.	_____	Mach No	_____	Line Insp	_____		
Lot Size	_____	Date	_____	Sample Insp	_____		
Sample Size	_____	Shift	_____	Operator	_____		
Broken Lot: Pcs	_____	Shift	_____	Pcs	_____		
				Defects in Sample	_____		
				O.K. Parts in Sample	_____		
				Def. Parts in Sample	_____		
				Scrap	_____		
				Salvage	_____		
				Disposition	_____		

## Sampling Inspection

Information from these lot sheets is then accumulated and issued daily to production supervision on a report sheet listing defects by machine and shift, *Fig. 12*. This report enables production

Each week another report, *Fig. 13*, is issued showing the complete story of the operations for a week. In addition to showing total production and the disposition of that production, the report shows the percent defective per machine and percent defective for each quality characteristic. This report has proved particularly useful to management in helping formulate long-range activities directed toward the prevention of defects. Along with the substantial improvement in quality obtained under this system, there has been an increase in productivity per machine.

Since the start of production, tapping of the flash-tube thread proved a troublesome operation. The dimensions involved a maximum depth under the flash-tube thread of 0.120 inch max and a pitch diameter of the thread of 0.3729 0.0051 inch. A process analysis was performed and the resultant frequency distribution chart indicated that the method of tooling was not within control. If this condition were permitted to continue, there would be considerable 100-percent inspection. Actually,

Fig. 12. Record sheet for listing defects by machine and shift using the same code numbers as the lot sheet.

[illegible]





there were occasions when 300-percent inspection was necessary to sort out shallow threads to meet specifications. In addition to costly inspection, low productivity was a serious threat to shipping commitments.

After extensive studies, the problems were solved by replacing the tapping head with a new type, using a reversible motor and gear-driven tap. The original head had a unidirectional motor, wire-driven cams and a clutch mechanism for reversing the tap. Following this change, another process analysis was performed. This time the characteristic bell-shape cluster was obtained on the frequency distribution chart. This pattern of normal variability indicated the process was capable of being controlled.

Analysis of the threading operation indicated that controlled operations could be performed with the new head. Also, a tap 0.002 inch larger could be employed and remain within the tolerances of pitch diameter inasmuch as the variations with the new head were half those for the old head. This resulted in greater productivity at a better quality level and less tap wear.

With these changes, high quality level was attained and an increase in productivity was realized at the same time, showing that proper equipment and tooling are a must in producing parts consistently to specifications. In Fig. 14 is shown a percent defective chart showing how defects have

## WEEKLY (DAILY) REPORT Control Sampling

73051 Body  
Kingsbury

Lot Size  
Sample Size

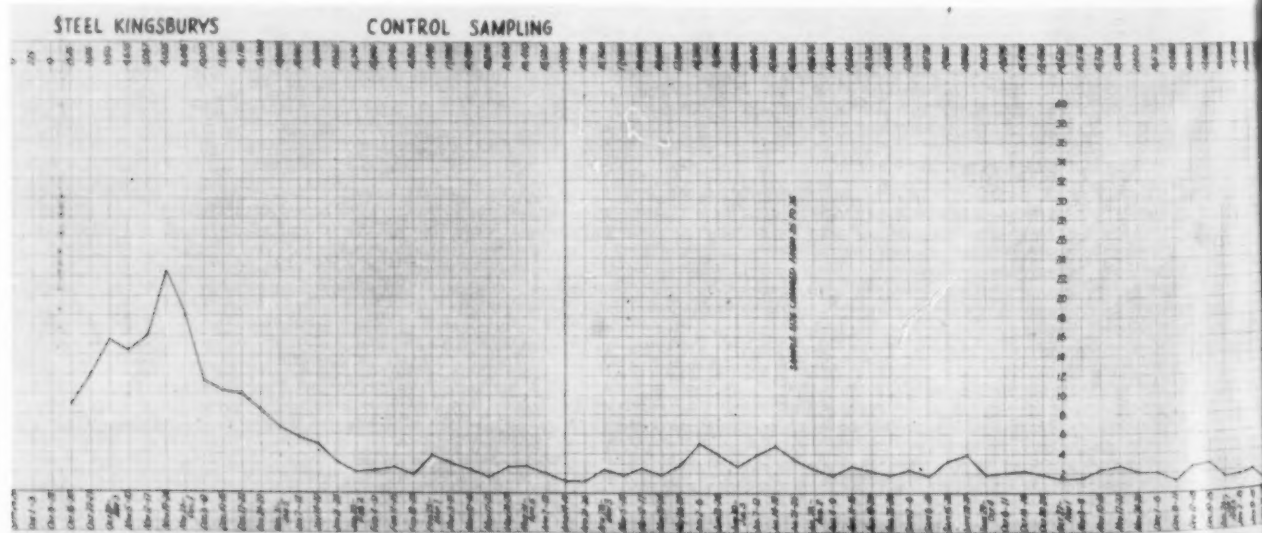
Date  
Shift

Mach	Lot Sample				Sampling Results				Categories Per Parts			
	Total	Lot	Ass	Rej	Total	O.K.	Def	% Def	Total	To	Set	% Def
1												
2												
3												
4												
Total												

## List of Defects Found in Sample

Code	Description	Defects	% Def
1	Diameter of interrupter cavity		
2	Location of interrupter cavity		
3	Alignment of flash hole & interrupter cavity		
4	Depth of interrupter cavity from center line		
5	Pitch diameter of flash hole threads (MAX)		
6	Pitch diameter of flash hole threads (MIN)		
7	Diameter of flash hole		
8	Diameter of flash hole (MAX)		
9	Diameter of flash hole (MIN)		
10	Depth of setting groove threads (MAX)		
11	Depth of setting groove threads (MIN)		
12	Depth of setting groove threads (MAX)		
13	Depth of setting groove threads (MIN)		
14	Gap of delay plunger cavity with flash hole		
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97	Gap of delay plunger cavity with flash hole		
98	Gap of delay plunger cavity with flash hole		
99	Gap of delay plunger cavity with flash hole		
100	Gap of delay plunger cavity with flash hole		
Total			

Fig. 14. Percent-defective chart records the progress obtained since sampling inspection was instituted as the control mechanism for four Kingsbury machines, all of which perform the same operations.

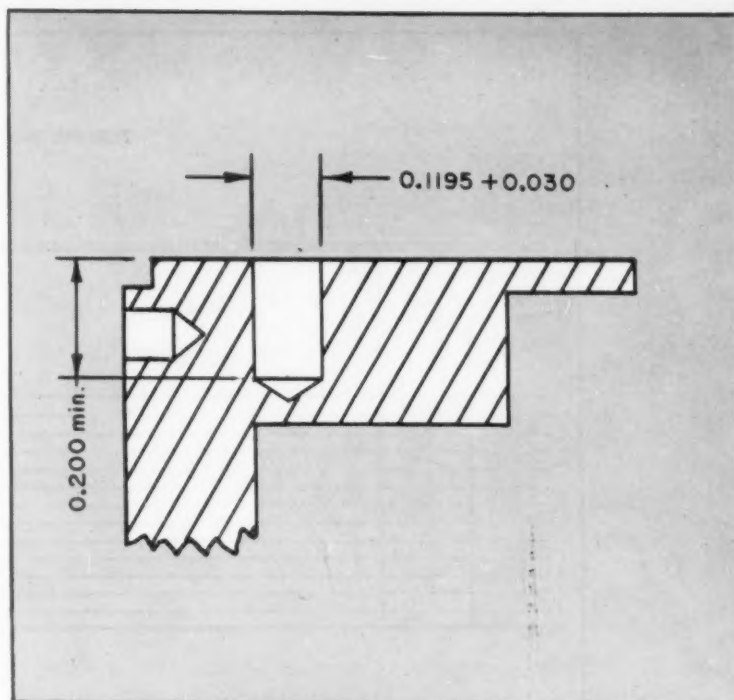


dropped to the 1 percent level for the composite of all 23 quality characteristics on these machines.

**Plunger Body:** In drilling the hole in the body shown in *Fig. 15*, the depth was shallow in sufficient number to cause high rejection and 100-percent inspection. The operation was performed in a drill press with manual feed to a positive stop. Process analysis of parts taken at random showed the out-of-control frequency distribution in *Fig. 16*. Another sample of consecutive parts when the operator conscientiously engaged the stop showed the process could be controlled. To remove the human element of variation, the drill press was equipped with a pneumatic cylinder type of positive feed. *Fig. 17* shows the results of the process analysis after the attachment was installed.

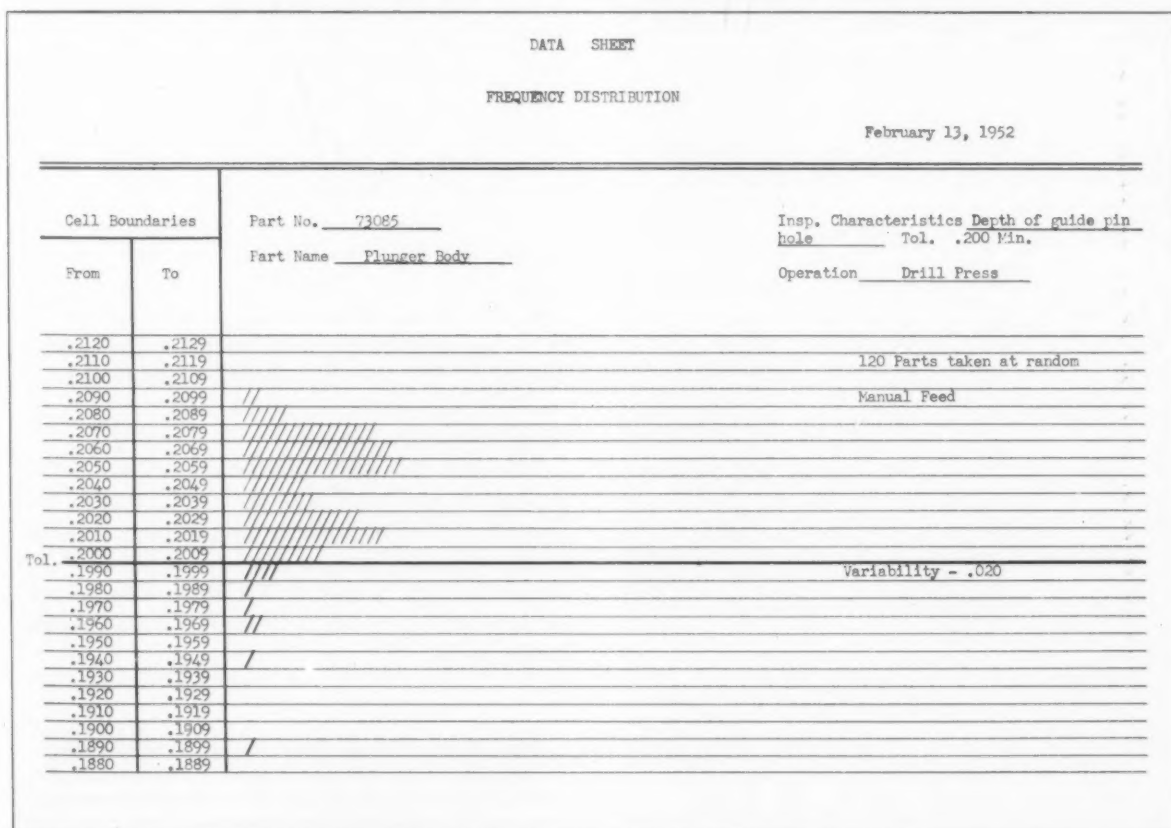
This illustrates how the human element can cause an out-of-control condition and defective work. By replacing the human element by a simple automatic feed, a more reliable and consistent operation results.

**Plunger:** Machined on a six-spindle automatic screw machine, the part shown in *Fig. 18* was being produced with a high percentage of rejects. Control



**Fig. 15.** Section of a plunger body. The depth of hole required proved troublesome on a production basis. Elimination of human element from the drill press feed solved the problem.

**Fig. 16.** Frequency-distribution chart for depth of hole produced by manual feed to a positive stop, indicating an out-of-control process.



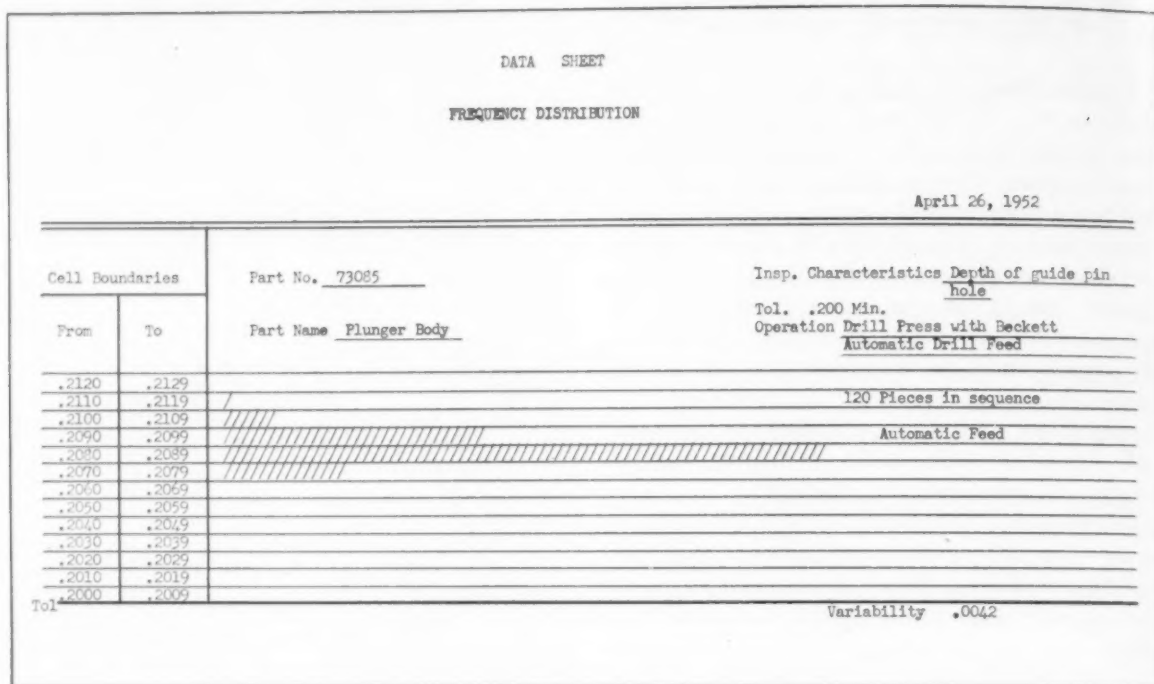
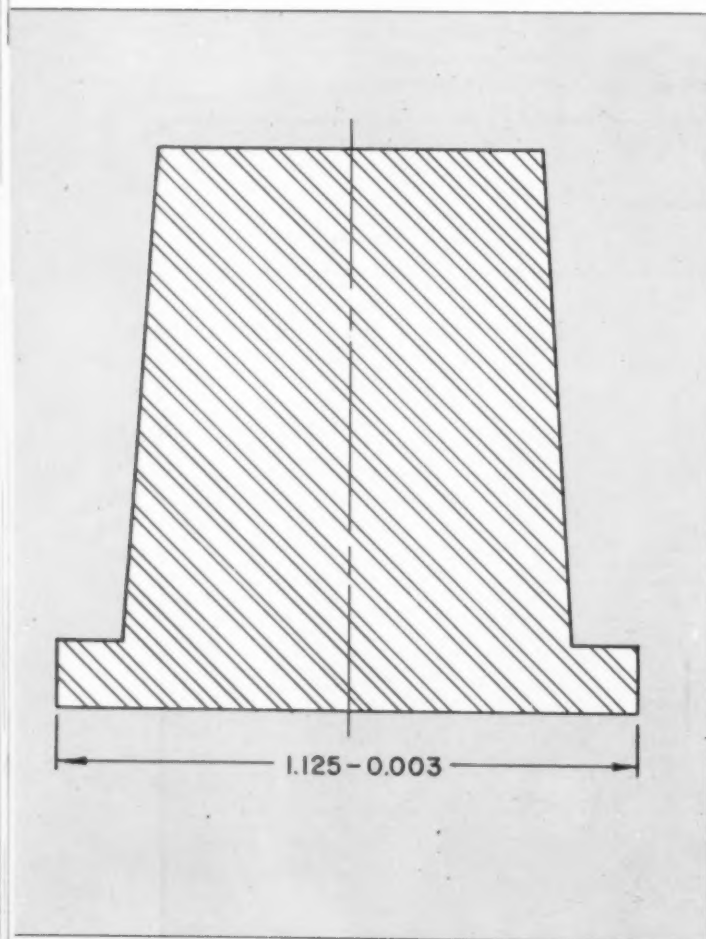


Fig. 17. Frequency-distribution chart for same operation but with an automatic feed. Removal of human element brought the process into control.



charts on the flange dimension indicated that the process was out of control. Because material from different sources was employed, the explanation was offered that difficulty was caused by material differences. Process analyses were made from runs of each stock. These analyses were identified for each spindle so as to treat the machine as six separate machines. Analyses performed in this way revealed that each spindle had variations equal to or greater than blueprint tolerances and that the average of 5 was considerably outside of tolerance. After adjustments were made on the machine, tests were run again for each spindle and for each material. This brought the machine within control and showed there was no difference attributable to the material. In this test the differences between spindle averages was less than 0.0003 inch. The chart for one material is shown in Fig. 3.

This and the other illustrations show how the production personnel with the aid of quality control can determine whether or not their processes can be depended upon to produce parts consistently to specification. If they do not, the system provides an analytical approach to determine the causes and correct them.

Fig. 18. The flange diameter is one of the critical dimensions on this plunger and was out of control until each spindle of a six-spindle automatic was brought into tolerances.



# Taps

The type of tap best suited for any given operation is dependent on the material to be tapped, the equipment available and the accuracy required.

In general, high-speed steel taps should be used for all production runs of tapping, particularly if modern, high-speed tapping machines are available.

The tolerances required in tapped holes usually determine the grade of the taps to be used:—i.e., cut thread taps, commercial ground thread taps, or precision ground thread taps.

PRECISION GROUND THREAD TAPS are available in several classes of fits.

The more common types of taps used in industry are:

HAND TAPS, now generally used for machine operation. They are the general purpose taps.

TWO AND THREE FLUTED HAND TAPS, used on many production jobs where soft and stringy materials are encountered.

CHIP DRIVER OR SPIRAL POINTED HAND TAPS, used where it is desirable to drive the chips ahead of the tap to avoid flute clogging. They should be used in through holes only.

## Operation

The two most important factors in the economical operation of taps, and production of tapped holes, are proper tapping speeds and proper lubrication.

## Tapping Speeds

The speed at which taps can be efficiently operated depends on a number of variables, such as composition and hardness of the materials to be tapped; depth of holes, type and condition of tapping machines and the cutting fluid used. For these reasons there can be no hard and fast rules for tapping speeds. The following table of tapping speeds for various materials should serve as a starting guide only. Adjustments, either up or down, should be made to best suit the particular material and conditions on any given job.

Speeds for High Speed Steel Taps\*

Material	Speed (fpm)
Aluminum	95 - 105
Brass	95 - 105
Bronze, Soft	55 - 65
Bronze, Hard	40 - 50
Copper	50 - 60
Die Castings	65 - 75
Duralumin	95 - 105
Iron, Cast	75 - 85
Iron, Malleable	50 - 65
Magnesium	95 - 105
Monel Metal	25 - 30
Plastics	70 - 80
Rubber, Hard	85 - 95
Steel, Machinery and Cold Rolled	50 - 65
Steel, Alloy Grades	25 - 35
Steel, Cast	25 - 35
Steel, Tool Steel Grades	25 - 35
Steel, Stainless Grades	20 - 30

\*Carbon Steel Taps should, in general, be operated at approximately one-half the speeds given above.

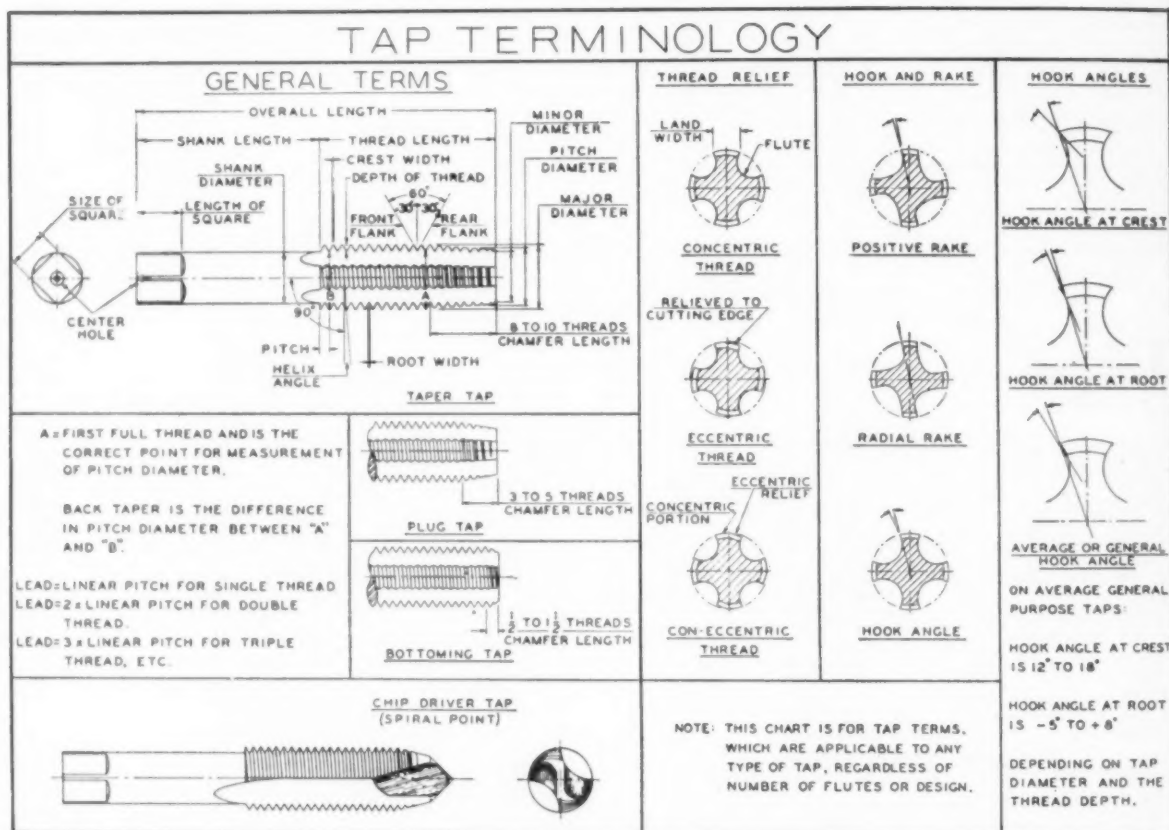
## Lubricants

The use of lubricants or cutting fluids is recommended for tapping nearly all metallic materials. The use of such cutting fluids promotes longer tap life, greater production through higher permissible speeds, better size control, better quality of work, and more efficient chip removal.

The following table suggests the general types of cutting fluids to be used for tapping various materials. It is recommended that further data and suggestions be obtained from the various manufacturers of such cutting fluids. This information is presented by courtesy of Winter Brothers Co., Rochester, Michigan.

## Lubricants for Tapping

Material	Lubricant
Aluminum	Kerosene and Lard Oil
Brass	Soluble or Light Base Oil
Bronze, Soft	Soluble or Light Base Oil
Bronze, Hard	Light Base Oil
Copper	Light Base Oil
Die Castings	Kerosene and Lard Oil or Soluble
Duralumin	Kerosene and Lard Oil or Soluble
Iron, Cast	Dry or Soluble Oil
Iron, Malleable	Sulphur Base Oil or Soluble
Magnesium	Dry
Monel Metal	Sulphur Base or Kerosene and Lard Oil
Plastics	Dry
Rubber, Hard	Dry
Steel, Machinery and Cold Rolled	Soluble or Sulphur Base Oil
Steel, Alloy Grades	Sulphur Base Oil
Steel, Cast	Sulphur Base Oil
Steel, Tool Steel Grades	Sulphur Base or Kerosene and Lard Oil
Steel, Stainless	Sulphur Base Oil



## Definitions

**ALLOWANCE:** The difference in dimensions between the minimum hole and the maximum screw.

**ANGLE OF THREAD:** The angle included between the sides of the thread measured in an axial plane.

**BACKED:** A word used by tap makers to express eccentric relief in the angle of a thread. Usually on a tap that is backed the eccentric relief does not extend to the cutting edge but stops some predetermined distance from it.

**BASE OF THREAD:** The bottom section of a thread; the greatest section between two adjacent roots.

**BASIC:** The theoretical or nominal standard size from which all variations are made.

**CHAMFER:** (Sometimes miscalled lead.) The taper at the end of the thread of a tap or in the throat of a die made by cutting away the crests of the first few threads to distribute the work of cutting over several threads and to act as a guide in starting the tap or die. This chamfer is relieved and a tap is classed as a taper, plug or bottoming according to the length of chamfer. In ordering special taps or dies, it is best to give the length of chamfer in inches.

**CREST:** The top surface joining the two sides of the thread.

**CREST CLEARANCE:** Defined on a screw form as the space between the top of a thread and the root of its mating thread.

**PERCENT OF DEPTH OF THREAD:** The depth of thread in contact of two mating parts, measured radially.

**DEPTH OF THREAD:** The distance between the crest and base of the thread measured normally to the axis.

**FLUTE:** That portion cut away between the lands. The use of this term in referring to the threaded portion of a tap is often confusing as on special taps the flute may be cut some distance up the shank to provide oil grooves.

**HELIX ANGLE:** The angle made by the helix of the thread at the pitch diameter with a plane perpendicular to the axis.

**LAND:** That portion of the thread not cut away by the flutes.

**LEAD:** The distance a screw thread advances axially in one turn: On a single thread screw, the lead and pitch are identical; on a double thread screw the lead is twice the pitch; on a triple thread screw the lead is three times the pitch, etc.

**LENGTH OF ENGAGEMENT:** The length of contact between two mating parts measured axially.

**LIMITS:** The extreme dimensions which are prescribed to provide variations in fit and workmanship.

**MAJOR DIAMETER:** The largest diameter of the thread on the screw or nut. The term "major diameter" replaces the term "outside diameter" as applied to the thread of a screw and also the term "full diameter" as applied to the thread of a nut.

**MINOR DIAMETER:** The smallest diameter of the thread on the screw or nut. The term "minor diameter" replaces the terms "core diameter" and "root diameter" as applied to the thread of a screw and also the term "inside diameter" as applied to the thread of a nut.

**NECK OR CUT OUT:** A recess or groove cut around the portion of the shank of the tap adjacent to the threaded section.

**PITCH:** The distance from a point on a screw thread to a corresponding point on the next thread measured parallel to the axis. The pitch equals 1.000 inch divided by the number of threads per inch.

**PITCH DIAMETER:** On a straight screw thread the diameter of an imaginary cylinder which would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cylinder.

**RELIEF:** The amount of cam or back-off from the cutting edge to the heel of the land. An indefinite term when applied to a tap or die. To be clear, it

should be specified whether relief on the chamfer or relief in the angle of the thread is meant.

**ROOT:** The bottom surface joining the sides of two adjacent threads.

**TOLERANCE:** The difference between the maximum and minimum dimensions of a given part. A tolerance may be expressed as plus or minus or both. A total tolerance is the sum of a plus or minus tolerance. It is prescribed in order to limit the variations in manufacture permissible for a given class of fit.

**THREAD, STRAIGHT:** A thread where the pitch diameter continues the same size for entire length of threaded section.

**THREAD, TAPER:** A thread where the pitch diameter increases at some constant ratio. (Care should always be used to specify a "taper thread" tap as a "taper" tap is merely one that is chamfered a certain distance at the end of the thread.)

**THREAD, DRUNKEN:** A thread in which the advance of the helix is irregular.

### Sizes of Taps and Tapped Holes

Tapped hole sizes are classified by specifications established by the U.S. Bureau of Standards.

Class 1, Loose Fit; Class 2, Free Fit; Class 3, Medium Fit; Class 4, Close Fit.

Class 1 Fit includes screw thread work in which the threaded parts must assemble readily.

Class 2 Fit includes the major portion of interchangeable screw thread work.

Class 3 Fit includes the highest grade of interchangeable screw thread work. Tapped holes within Class 3 tolerances are difficult and expensive to produce commercially in the smaller sizes.

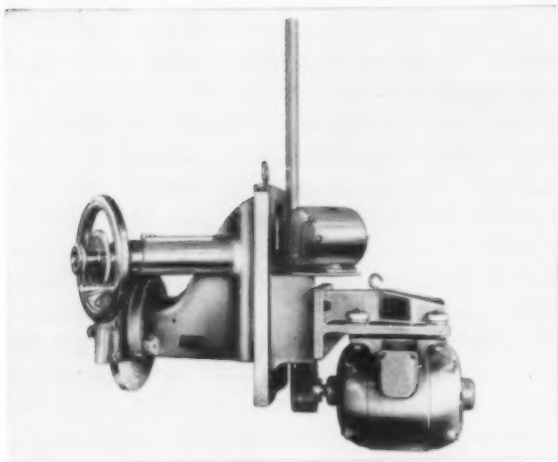
Class 4 Fit includes screw thread work requiring a snug fit. In this class selective assembly of parts may be necessary.

The minimum tapped hole is always basic size. The maximum screw is below basic for Class 1; basic for Classes 2 and 3; over basic for Class 4 fit. Plug thread "Go" gages, basic size and "No Go" gages, maximum hole size; must be used when specified fits are to be maintained.

**Note:**—Do not confuse the tapped hole specifications with the tap specification. Tap specifications represent measurements of the taps, but not of the tapped holes, which will usually be larger than the taps, the amount depending on various operating conditions.

Bear in mind that the outside diameter of the tap, as long as it is large enough, has nothing to do with the fit of a screw in the tapped hole. An increase over standard diameter simply cuts clearance above the screw thread. This is desirable, and at the same time allows for the wear of the tap which is much greater on top of the thread than on the angular sides.





## ISOLATES VIBRATIONS in Precision Grinder

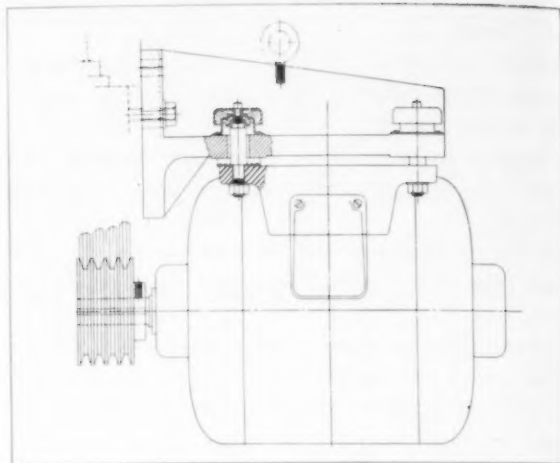
By William C. Gallmeyer

Gallmeyer & Livingston Co.  
Grand Rapids, Mich.

**D**EMANDS FOR increased accuracy and improved finish have led to a study of the disturbing forces that result in surface imperfections.

When analyzing finishes produced on a horizontal spindle surface grinder, there are two distinct types of measurements involved. The first basic type is commonly known as a scratch pattern, which is generated by the individual grains of the grinding wheel. In normal grinding practice, this surface roughness will fall in the range of 5 to 20 rms microinches, and is readily visible to the eye. A second form of surface roughness is more difficult to analyze as it is not measurable with ordinary surface analyzers and is seldom visible.

This wave pattern is attributable, to a large extent, to vibrations which create relative movement between the grinding wheel and the workpiece. The exciting forces which cause these vibrations are numerous but the rotating equipment directly connected to the grinding wheel spindle has been found to be the principal source of trouble. Grinding wheels are effectively balanced by adjustable balance weights in the wheel mounting flange, leaving the motor as the main source of vibration.



The grinding wheel is driven through a V-belt drive with motor mounted directly on the spindle head. Any vibration originating in the motor is transmitted directly to the spindle head and to the grinding wheel. In an effort to overcome vibration difficulties and produce satisfactory ground finishes, a special motor was designed and built.

Using the rotor and stator portions of a commercial motor, a special motor was constructed with a heavy, rigid frame and an oversized shaft mounted on precision ball bearings.

This design incurred all of the problems of precision fits and tolerances. A further refinement was a dynamic balancing operation, which was a necessity regardless of the time required. Although this process produced an extremely smooth running motor, the cost of the finished product was several times that of a standard motor. A further disadvantage was the one source of supply for rotors and stators to fit the special frame, and the fact that the user had no possibility of substituting a standard motor in the event of a breakdown.

To eliminate the many disadvantages of the custom-built motor, the assembly shown in the illustration was evolved. This motor is isolated from the mounting bracket by a vibration absorbing medium. In this way, the energies from mechanical unbalance, electrical unbalance and bearing roughness are dissipated within the motor rather than in the machine itself. A vibration absorbing pad is located under each foot of the motor. By careful selection of the isolating medium and proper design of the motor mounting bracket, it was possible to obtain performance equal to, or better than, that secured with the previous custom-built design.

This latest design, using standard motors, offers a number of advantages. The manufacturer is able to supply the user with the type of motor he desires. Also, because the design is based on standard NEMA frames, motors may be obtained from any motor manufacturer.



# news

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## Bryan Heads Standards Committee; Other Appointments Announced

Appointments of ASTE's national committee chairmen were completed by President Roger F. Waindle when he named George F. Bryan to head the National Standards Committee. Mr. Bryan, a member of the Pontiac chapter, succeeds R. C. W. Peterson in the position. Serving with him on the committee are Leslie B. Bellamy, past president of the Society and member of the Detroit chapter; Joseph C. Brenner, Long Island chapter member; William Moreland, Rockford chapter member; and Mr. Peterson, national secretary of ASTE and a member of the Toledo chapter.

Members in the National Constitution and Bylaws Committee have been announced by Chairman John X. Ryneska. They are: Edward J. Berry, Little Rhody member, and Vincent M. Spahr, Lima member.

### Editorial Committee

Named to serve on the National Editorial Committee by Chairman Joseph L. Petz are: Edward W. Dickett, Chicago member; Lee M. Davis, Twin States member; Gordon Swardenski, Peoria member; and George P. Torrence, Rockford member.

Arthur R. Diamond, chairman of the National Education Committee, has appointed the following: Prof. Myron L. Begeman, Houston member; Prof. J. N. Edmondson, Columbus member; Prof. William W. Gilbert, Waterloo Area member; Orville D. Lascoe, Indianapolis member; Prof. Frederick Preator, Salt Lake City member; and

C. Douglas Wright, Toronto member.

Chairman Francis J. Sehn has appointed these members to the National Book Committee: Maurice M. Clemons and Glenn A. Hier, Cleveland members; Norman L. Kenerson, Detroit member; Willis J. Potthoff, St. Louis member; Edward A. Reed, Saginaw Valley member; Ralph F. Weil, Pontiac member; Ray J. Wilcox, member at large; and Philip C. Wood, Toledo member.

Serving with H. Dale Long, chairman of the National Finance Committee, are: Duane H. Brighton, Peoria member; H. E. Collins, national treasurer of ASTE and member of the Houston chapter; Frank J. Hausfeld, Jr., Evansville member; Fred Kampmeier, Rockford member; and Daniel B. Wesson, Springfield, Mass., member.

Members of the Honor Awards and Judicial Committees, appointed by Chairman William H. Smila, include the following past presidents of the Society: T. Bert Carpenter, Frank W. Curtis, Frank A. Shuler and Walter Wagner, Detroit members; A. H. d'Arcambal and Ray H. Morris, Hartford members; James R. Weaver Springfield, Mass., member; and Otto W. Winter, Burralo-Niagara Frontier member.

### Clark Appoints Thirty

Appointments for the National Membership Committee, the largest committee in ASTE, were made by Chairman A. B. Clark. Serving at Area Captains are: Irving H. Buck, North Texas member; Dale H. Burke, Toledo member;

National ASTE officers met recently in Detroit for their Spring meeting. From left: Harry E. Conrad, executive secretary; R. C. W. Peterson, secretary; Wayne Ewing, assistant secretary-treasurer; Joseph P. Crosby, first vice president; H. E. Collins, treasurer; Roger F. Waindle, president; Dr. H. B. Osborne, Jr., second vice president; H. C. McMillen, third vice president; and Allan Ray Putnam, assistant executive secretary.

W. L. Foss, Denver member; Robert L. Gay, Hartford member; Emil Kitzman, Philadelphia member; Robert W. Miller, Piedmont member; Oliver J. Onken, Chicago member; Philip C. Richardson, Buffalo-Niagara Frontier member; William W. Schug, Mid-Hudson member; Louis Slager, St. Louis member; John H. Stansbury, Long Beach member, and Harry H. Whitehall, Grand River Valley member.

Appointed Area Lieutenants are: Clarence P. Bidle, Detroit member; Charles H. Briggs, Syracuse member; George W. Christiansen, Racine member; Lawrence H. Cook, Little Rhody member; Frederick J. Crook, Toronto member; Frederick W. Dunn, Niagara member; Frank A. Flannery, Akron member; F. J. Geoffroy, Denver member; William H. Gourlie, Hartford member; Colin J. Grinstead, Montreal member; Carl Kertesz, Greater New York member; H. Verne Leoppert, Chicago member; Richard C. Montanus, Springfield, O., member; Harry E. O'Hara, Memphis member; E. H. Porter, Indianapolis member; Orville B. Strahm, Wichita member; William W. Young, Boston member, and Albert H. Ward, London-St. Thomas member.

Serving with Chairman Kenneth W. Riddle on the National Program Committee are: Thomas C. Barber, Chicago member; and Ralph Chrissie, Los Angeles member.

### Ruder Names Members

Edward C. Ruder, chairman of the national Public Relations Committee, named to his committee: R. Eric Crawford, Toronto member; Charles O. Herb and H. E. Linsley, Northern New Jersey members; William Schleicher, Chicago member; and Wilfred B. Wells, Boston member.

Members on the National Committee on Professional Engineering, announced by Prof. L. E. Doyle, chairman, are: Hugo L. Aglietti, Long Island member; William A. Dawson, Hamilton District member; V. H. Gallichotte, Golden Gate member; Howard W. Gross, Philadelphia member; Herbert G. Heimann, Milwaukee member; Clyde T. Mooney, Detroit member; and Leslie C. Seager, Salt Lake City.



# Chautauqua-Warren Chapter Receives ASTE Charter



Dr. Harry B. Osborn, Jr., fourth from left, presents ASTE's 109th charter to Robert J. Wilson, Jr., Chautauqua-Warren chapter chairman. Other officers, from left, are: Paul E. Anderson, secretary; Norman L. Wetter, assistant secretary; Mr. Wilson and Dr. Osborn; C. Irwin Hochhaus, second vice chairman; Herbert Cave, first vice chairman; and Gordon H. Carlson, treasurer.

Production experts from two states are represented in the Chautauqua-Warren chapter, newest addition to the American Society of Tool Engineers which received charter number 109 at the Hotel Jamestown in Jamestown, N. Y., on May 13. The new chapter was founded for ASTE members living in Chautauqua County, N.Y., and Warren County, Pa. More than 200 persons were present for the opening meeting, 179 of them were charter members.

The ceremonies were conducted by Dr. Harry B. Osborn, Jr., second vice president of the Society. He installed the following officers: Robert J. Wilson, Jr., chairman; Herbert Cave, first vice chairman; C. Irwin Hochhaus, second vice chairman; Gordon H. Carlson, treasurer; Paul E. Anderson, secretary; and Norman L. Wetter, assistant secretary.

The charter night was attended by guests from the Buffalo-Niagara Frontier, Erie and Pittsburgh chapters and A. B. Clark, chairman of the National Membership Committee, and Marvin Bunting, national ASTE headquarters staff. Mr. Clark made the presentation of the membership kit.

Committee chairmen of the chapter are: Cleon L. Douglas, constitution and bylaws; Laurence R. Green, editorial; Raymond F. Samuelson, education; Leslie H. Beaujean, membership; Linsly G. Brown, professional engineering; Robert H. Alexander, program; Richard J. Misener, public relations; and Robert W. Philblad, standards.

The technical program was presented by Francis R. Springer of the Denison Engineering Co., Columbus, O., who gave a talk on uses of hydraulic power in presses for production. He was aided by two assistants, F. E. Ervin, and H. M. Borrer, field engineers. Movies were shown in conjunction with the talk.

## Final Meeting Honors Elmira Advertisers

Elmira—At the closing meeting for the year, nearly 100 members and guests of the Elmira chapter observed advertisers' night at a program held May 11 at the Mark Twain Hotel.

D. Mosher received the service award pin for his outstanding work with the chapter's education committee.

Speakers for the evening were J. Colleta, a former officer with United States Intelligence; Mr. Anderson, president of Hardinge Brothers; and Mr. Emerson, manager of the Mark Twain Hotel.

—John D. Graham

## Sargent Returns from Tour of Asia; Reports New Slant on Life in Far East

A new understanding of the peoples of Asia and a completely different slant on life in the Far East was reported by A. M. Sargent, a past president of ASTE, on his return in May from a month-long air tour of China, Japan, Siam, and the Philippines, made with 22 other members of the Detroit Board of Commerce. Mr. Sargent said the trip was undertaken in the belief that if businessmen from different sections of the world could sit down together "some mutual good is bound to come from it."

The group, which visited Tokyo, Hong Kong, Singapore, and other Asiatic centers, was repeatedly startled at the pitifully inadequate production methods. In Manila Mr. Sargent spent a day and a half at a Philippine firm which had set up a factory employing 300 workers without the aid of a single trained engineer. They had begun production of office equipment and other metal products solely by reading American trade magazines. Not one of them had ever been inside a production plant.

"They did wonders, considering what they had to work with," Mr. Sargent said. "But some of the questions they asked were so basic they would have been ridiculous—if they hadn't been so pitiable."

The visitors, who covered 23,000 air miles, were entertained by Elpidio Quirino, president of the Philippines, and talked with other top men in the Far East, including Chiang Kai-shek and Gen. Mark Clark.

While having breakfast one morning at the Imperial Hotel in Tokyo, Mr. Sargent saw his good friend Walter Praeg of National Broach and Machine Co. and a member of the Detroit ASTE chapter. He ran into him again in Hong Kong. Another familiar ASTE face was that of Paul Zerkle of Michigan Tool Co. Mr. Sargent also visited with Robert K. W. Suez, a former student of Prof. O. W. Boston at the



Mr. Sargent discusses letters received from Far Eastern friends.

University of Michigan, who is now living in Hong Kong.

Always an enthusiastic ambassador for the American Society of Tool Engineers, Mr. Sargent found candidates for membership in Hong Kong and Manila and saw to it that they received ASTE application blanks.

## Chapter Tours Plant of Textile Machine Works

Reading, Pa.—Following dinner and a business session at Reeser's Restaurant on May 19, members of the Greater Lancaster chapter toured the plant of the Textile Machine Works at Wyoming. The tour included the machine shops, assembly and experimental knitting departments. The company is the world's largest builders of full-fashioned knitting machines and owns the world's largest foundry under one roof.

After the tour the firm presented an initial showing of its new movie, which was made up in three parts: "First Operations in the Foundry Division," "Textile Machine Works," and "Operation Knitting Machines."

Plans were made for a trip to Baltimore on October 3 for a combined meeting of the York, Baltimore and Greater Lancaster chapters and a visit to the Bethlehem Steel plant and shipyard.

—George J. Coil

## Peterborough Members Hear S. E. Beer

Peterborough—Latest developments in the turning field were discussed April 9 by S. E. Beer, distributor sales manager, Monarch Machine Tool Co., Sidney, O., at a meeting of the Peterborough and District chapter. Mr. Beer also showed movies of tracer lathe application.

The technical session and dinner, sponsored by Williams & Wilson, Ltd., Toronto, were attended by 40 members and guests. A *Tool Engineers Handbook* was presented to William Sweet.

—Fred H. Mason



Checking in for their first official plant tour at Carboloy Department of General Electric Co., Detroit, are these student members from the University of Michigan who visited the plant on May 21.



Every member of the 1953-54 National Editorial Committee was present when the group's first meeting was called to order on May 2 in Detroit. Pictured with Chairman Joseph Petz, center, are (from left): Lee M. Davis, Edward W. Dickett, Gordon Swardenski, and George P. Torrence.

## Michigan Student Members Tour Carboloy

Detroit—The first organized student chapter of the American Society of Tool Engineers celebrated two other firsts on May 21—its first official plant tour, and the awarding of a \$700 ASTE International Education Award to one of its charter members.

Organized at the University of Michigan in April under a temporary charter of the Society, the chapter visited the plant of Carboloy Department of General Electric Co. While there, one of its members, Bruce MacGregor of Livonia, Mich., was presented one of ten scholarships, awarded annually by ASTE in the United States and Canada to promising tool engineering students maintaining high scholarship standards.

The award was made by Roger F. Waindle, national president of the Society, during a special luncheon for the chapter at the Carboloy plant.

According to K. R. Beardslee, gen-

eral manager of Carboloy, who greeted the visitors as they arrived by bus from Ann Arbor, the tour is to be an annual event. Before going through the plant, the student members saw a movie "Everyday Miracles," which summed up the role of cemented carbides in the nation's production operations. Following the film, they witnessed actual cutting operations involving cemented tungsten carbides, and were brought up to date on manufacturing procedures and properties of the hardest metal made by man.

## Tells How to Get Better Gears at Lower Cost

New Orleans—Charles R. Staub of Michigan Tool Co., Detroit, presented a paper at the May meeting of the New Orleans chapter held at Tulane University. Mr. Staub spoke on the fundamentals of getting better gears at lower costs. The coffee program consisted of a color movie on tarpon and bass fishing. The meeting was attended by more than 100 members and guests.

In April the ASTE program concerned the manufacturing of 90 mm cartridge cases by the Rheem Mfg. Co. of New Orleans. Lou Tuglus of Clearing Machine Corp., Chicago, covered the new type of hydraulic presses and conveyors used in making the shell cases. Robert Couret of Rheem Mfg. explained in detail the various operations, using movies and samples for illustration. The technical session drew an attendance of 90 persons.

At the installation and Ladies' Night meeting held in March, Dr. Harry B. Osborn, Jr., second vice president of the Society and technical director of Tocco Div., Ohio Crankshaft Co., Cleveland, installed the chapter officers and gave a talk on induction heating.

## Society Publishes Report to Exhibitors

Of major interest to executives and sales personnel of manufacturers of industrial equipment, particularly those who participate in industrial expositions, will be a comprehensive "Report to Exhibitors" just published by ASTE.

Included in the booklet are the findings of a complex study as to buying authority by functions of individuals in industry. This study covers such products as cutting tools and toolholders, dies, jigs and fixtures, grinding machines and attachments, grinding wheels and abrasives, hydraulic and pneumatic equipment, inspection equipment and instruments, lubricants and coolants, machine accessories, machine tools, materials handling equipment (automatic), presses and metal-forming equipment, refractories, etc.

Relative buying or specifying authority for each of these products is tabulated for the following classes of individuals:

Top management and administrative (including presidents, partners, directors, vice presidents, administrative department heads, purchasing executives, etc.); equipment, methods, process and other tool engineers; production executives; products, consulting, factory and metallurgical engineers, technicians and plant personnel; distributors and sales representatives; military, and miscellaneous.

The booklet is based on a combination of two studies: (1) an industrial exposition attendance survey by the John T. Fosdick Associates of New York City, and (2) a study of data available from tens of thousands of individual visitors' registration records. Copies of the booklet are available on request from the Society.



Frank A. Shuler

## Shuler Wins Award for Service with NPA

Past President Frank A. Shuler, who headed the American Society of Tool Engineers in 1937-38, has been awarded a Certificate of Service for his work last year with the National Production Authority. Signed by former Secretary of Commerce Charles Sawyer and NPA Administrator R. A. McDonald, the certificate was presented "... in appreciation of service rendered to the United States Government in time of national emergency and in official recognition of the outstanding experience and ability for which you were selected to serve as an employee without compensation through the cooperation of Chrysler Corporation."

Mr. Shuler was associated with Chrysler for nearly twenty years as master mechanic of the Highland Park plant. In his work with NPA he toured the nation making progress reports for plants with government contracts.

## Grant Made to Combat Shortage of Engineers

A grant has been awarded by the American Society of Tool Engineers for a study to help combat the ever-increasing shortage of trained engineers faced by the United States and Canada. Roger F. Waindle, president of ASTE, has announced the grant to the Foundation for Research in Applied Psychology, Inc. of Chicago, a nonprofit corporation. He said the first phase of the study has been started by Dr. Joseph E. King, Ph. D., and Judith W. Wingert of the Foundation staff.

Development of a basis for a more universal "job description" and training program for the tool engineer is the purpose of the first phase of the study, Mr. Waindle said. Through a survey of the duties, responsibilities, requirements and assignments of tool engineers an analysis of current high school and college courses and company in-plant training programs will be made to pinpoint means of combating the shortage of trained engineers, he added. A report will be made available for use by industry and educators.

## Portland Chapter Holds Ladies' Night

Portland, Me.—A full program of activities was scheduled May 8 for the Ladies' Night program of the Portland chapter. Dinner, a short business meeting, a talk on television, entertainment and dancing were enjoyed by more than 30 members and guests.

Hildreth Fisher of the Bell Telephone Co. gave a talk on "Television Skyways" and a demonstration of research work.

—Henry C. Hagman



Included in the crowd of 350 persons who attended the annual Ladies Night of the Windsor chapter were, from left: David C. Heath, past chairman, and Mrs. Heath; Mrs. Jack Johnston and Mr. Johnston, present chairman; Mrs. Frank A. Ritchie and Mr. Ritchie, first vice chairman and chairman of the entertainment committee. The party was held at Beach Grove Golf Club.



After dinner at the Prince Edward Hotel on May 11, the Windsor chapter visited the plant of Dominion Forge & Stamping Co., Ltd. Pictured here are: David Heath; David L. Marshall, plant superintendent; R. T. Herdegen, president and general manager; Jack F. Johnston and W. B. Turner, chief plant engineer. Mr. Herdegen welcomed the group.

—Ernest W. Harris.





The speakers' table at Worcester's May meeting was occupied by, from left: E. Roland Ljungquist, delegate; Louis J. Fruman, first vice chairman; Walter J. Dawson, sales manager, Chromaster Div., Ward Leonard Electric Co., and program speaker; John E. Rotchford, chairman; J. Irving England, secretary; Daniel Sherman, Ward Leonard Electric Co.; and Leonard Krasnow, chairman of the standards committee. The dinner session was attended by 50 members and their guests.  
—Alvin H. Shairman

## Editor Addresses New York ASTE Chapter

New York City—To the basic structural metals on which our economy is built—iron, aluminum and magnesium—will soon be added titanium and zirconium. These and other metals which only a few years ago were laboratory curiosities, are today evoking wide interest among metal fabricators and designers, D. I. Brown, technical editor of *Iron Age*, told members of the Greater New York chapter of ASTE at the May meeting.

Other program speakers at the technical session held at the Hotel Shelton were Dr. Karl Cohen, vice president, Walter Kidde Nuclear Laboratory, Garden City, N.Y., and Charles V. Moore, design engineer, Knolls Atomic Power Laboratory, Schenectady, N.Y.

In his talk on "Metals for Tomorrow," Mr. Brown said other "new" metals include cerium, germanium, lithium, molybdenum, selenium, silicon, and vanadium. Many of these are at present either difficult or expensive to produce in usable form.

Titanium is the fastest growing of the new metals. Production, spurred by defense needs, has jumped from a few grams in 1949 to 1200 tons in 1952. While commercial use has as yet been limited, the metal is being widely tested for application in jet aircraft.

Zirconium, because of its unusual resistance to corrosion and the peculiar property of low thermal neutron cross-section, is in high demand by the Atomic Energy Commission for use in nuclear reactors. AEC needs, however, demand a zirconium metal of unusual purity. Used in a Navy pump, zirconium has demonstrated resistance to corrosion far above the best of present-day materials. Ten alloy systems of zir-

conium now fully tested include: hafnium, titanium, aluminum, molybdenum, copper, nitrogen, oxygen, tantalum, columbium, and tungsten.

Dr. Cohen said the availability of tremendous amounts of energy in existing uranium deposits, rather than the promise of lower cost, is one of the most significant aspects of the future utilization of atomic energy as a source of commercial power.

Pointing out that the major portion of present capital investment in electrical generating and transmission facilities would be necessary even if nuclear reactors are used to produce power, Dr. Cohen said that "the promise of using atomic energy instead of coal as the primary source of heat resides in the fact that one pound of uranium generates as much heat by fission as 1250 tons of coal."

"Through the reduction of both the cost and the bulk of fuel," he said, "the potentiality exists of bringing electric energy to large sections of the globe where either the availability or the cost of coal limits the power capacity. Another equally important consideration is that the amount of available energy in uranium deposits is very large—larger in fact than in coal deposits—and this has great importance when we consider the relationship between our expanding needs for power and our fuel reserves."

This means, according to Dr. Cohen, that every place on earth is potentially as close as any other to power. It does not mean, he cautioned, that atomic power is useful only in remote or undeveloped regions. It has a place in the most highly developed industrial centers, he contended. *Robert Frechman*

## T. J. Donovan Attends Ladies' Night Program

An attendance of more than 400 members and guests of the Grand River Valley chapter helped to make the Ladies' Night party an outstanding success. The event was held May 8 at Leisure Lodge near Preston.

A special guest at the gathering was Thomas J. Donovan, Jr., a past national director of the Society. Mr. Donovan conducted a quiz program for the ladies and provided hand-carved animals as prizes for correct answers. He was introduced by Harry Whitehall, a charter member of the chapter.

Among those seated at the speakers' table, in addition to Mr. Donovan, were: Mr. and Mrs. Jack Ward, Mr. and Mrs. Sam Boyer, Mr. and Mrs. Doherty, Mr. and Mrs. Alex McIntosh, Mr. and Mrs. Percy Barber, Mr. and Mrs. Selwyn Pritchard, Mr. and Mrs. Dave McCready, Mr. and Mrs. Clayton Henderson, Mr. and Mrs. Roy Robertson and Mr. and Mrs. Carl Hawley.

A reception preceded the banquet and dancing completed the evening's program.

—W. C. Little



E. J. Novack

## Richmond Program Features Talk by Novack

Richmond, Ind.—Speaker at the May 12 meeting of the Richmond ASTE chapter was E. J. Novack, engineer with the Detroit office of Kennametal, Inc. His talk highlighted the dinner meeting held at the Leland Hotel.

The program also included slides and movies on carbide tooling and a brief business session. Nearly 70 members and guests were present for the meeting, including C. R. Miller, Dayton representative for Kennametal.

—E. L. Hale



The success of their first annual dinner dance is indicated in the happy smiles of this group of officers and committee chairmen of the Patterson ASTE chapter. The party was held at the Alexander Hamilton Hotel and drew a record attendance.

### Paterson's First Dance Attended by 250 Couples

Paterson, N.J.—A capacity crowd of more than 500 members and guests spent an enjoyable evening April 18 when the first annual dinner dance was held at the Alexander Hamilton Hotel by the Paterson chapter of ASTE. Originally planned for the main ballroom, the party flowed over to the adjacent McBride Room so the record attendance could be accommodated.

After the turkey dinner was served, Jimmy Grimes and his orchestra and a four-piece combo provided music for dancing. Rounding out the program of entertainment were Ralph Sinclair, master of ceremonies; the Hilltoppers, a close-harmony quartet; and Kurnitz and Thompson, a novelty duet. Corsages were presented to the ladies and boutonnieres to the tool engineers.

Arrangements for the successful affair were made by James McCann, chairman of the entertainment committee. Assisting him were: Tom Zack, Frank Benzoni, Bob Neeb, Virgil Luciani, Ben Mainenti, Ken Schoolcraft, Henry Palmesino, and Charles Wenschuh. Publicity was handled by Frank Rizzuto.

### Evansville Chapter Tours GE Tube Plant

Evansville—On May 11 more than 175 members of the Evansville chapter traveled to Owensboro, Ky., for dinner and a tour at the General Electric Tube plant. Speakers were I. D. Daniels, works manager, and William M. Whelan, superintendent of metal tubes. Program chairman for the evening was Charles H. Thuman.

—William Gaines

### Rockford Announces Design Contest Winners

Rockford, Ill.—Winners of a design contest sponsored by the Rockford chapter of ASTE were announced May 14 at a meeting held at the Lafayette Hotel.

Dennis Folkerts won the grand prize of \$40. The first prize of \$25 was awarded to David Seal. Other prizes were presented to Dennis Mullins, Richard Byrum, Walter Bunk, and Ramon Champion.

Instructors Al Sabin and Gordon DeLaRonde cooperated with the chapter and the Automatic Pencil Sharpener Co. of Rockford in conducting the contest. The ASTE committee in charge of the contest consisted of Walter Lewis, Howard Nelson, John Floden, Ed Varnum and Chester Kostrzewa.



Student memberships in the Society were presented May 12 to five outstanding industrial engineering students at Evansville College. The awards were made by Paul Vierling, chairman of the Evansville ASTE chapter. Pictured are, standing: Sylvester A. Winterheimer, Jerry L. Gerling and Jeryl I. Schornhorst. Seated: Jack W. Alexander and Ronald Jack Boren.

### Scholarships Awarded at Salt Lake Meeting

Logan, Utah—Scholarship presentations highlighted the May 15 meeting of the Salt Lake City chapter held in the home town of Utah State Agricultural College. An ASTE International Education Award was presented by Prof. Frederick Preator; member of the National Education Committee, to Jay Beazer, junior student at Utah State and a charter member of the Tool Engineers Club. Scholarships were also awarded from the Salt Lake City chapter to three other students with high academic standings.

### Dr. Schmidt Lectures

Technical speaker at the meeting was Dr. A. O. Schmidt, research engineer, Kearney & Trecker Corp., Milwaukee, who spoke on "Practice and Theory in Carbide Machining." He gave an account of experimental work in metal-cutting, discussing cutting speed, tool angles and materials. The technique and results of laboratory tests which provide fundamental data for the design of better machine tools and cutters were also presented. The interpretation and application of experimental data to production problems was illustrated with slides.

### Discusses Alloys

At the April meeting held in Salt Lake City, 30 members heard a talk by A. J. Seeds, sales engineer, Cerro De Pasco Corp., New York. Mr. Seed described how Cerro alloys could be used in industry in his discussion of practical applications of low temperature alloys.

—Reid L. Rice

## Daystrom Night Takes Mid-Hudson Spotlight

Poughkeepsie—J. F. Brehm, president of Daystrom Electric Corp., addressed the Mid-Hudson chapter of ASTE at the May observation of "Daystrom Night." Mr. Brehm, coffee speaker on the program, talked on "Human Relations in Industry," citing the progress made in the past 15 years between management and employees in modern industry. He told of the results of a survey which was conducted among Daystrom employees to determine the employee-management relationship for the company.

Other executives of Daystrom heard on the program were J. F. O'Neill, manager of the industrial sales division, and Charles R. Frost, sales manager of the Crestwood Division.

Mr. O'Neill spoke on "The Importance of the Tool Engineer to Sales" and stressed the need for efficient tool design in order to market a saleable item which can meet the increasing competition in sales today. He also pointed out the importance of teamwork and noted that one corporation increased its production by a ratio of 20 to one in a twelve-month period due to such teamwork.

Mr. Frost displayed a new line of magnetic tape recorders, not yet introduced to the public for commercial sales, to a highly interested ASTE audience.

Plant tours of local industry were conducted during the afternoon and were followed by the dinner and program at the Nelson House. Chairman Stanley P. Cook conducted the meeting.

In April about 130 members and guests attended a joint meeting of the



At the May meeting of the Muncie ASTE chapter, Glen Harmon, second from left, assistant chief engineer, and Charles DeLorme, third from left, assistant sales manager, Colonial Broach Co., presented a program on broaching. With them are pictured, from left: Norman Hines, Muncie chapter chairman; Lester Lotz, program chairman, and Carl Dargor, first vice chairman.  
—D. C. Wedlick

American Society for Quality Control and the Mid-Hudson chapter of ASTE. Speakers were Stanley G. Johnson and Francis B. Murphy of Johnson Gage Co. Their subject was "Screw Threads and Their Gaging."

During the slide illustrated lecture, Mr. Murphy traced the history of screw threads, outlined the progress of gages during the twentieth century and described a system for inspection and control of gages.

The theory of statistical quality control for inspection procedures was also discussed. "Quality cannot be inspected into the part," Mr. Murphy said, "it must be built into the product."

The "exercise of judgment" in inspection work should be eliminated and can be, by proper engineering specifications, correctly designed and properly used inspection equipment, and effective inspection authority.

—Edward W. Nielsen

## Hydroforming Discussed by St. Louis Speaker

St. Louis—Speakers from the Cincinnati Milling Machine Co. presented both the coffee talk and technical address at the May 7 meeting of the St. Louis chapter. Some 200 members and their guests attended the dinner session held at the DeSoto Hotel.

An entertaining and thought-provoking talk on economics and its alliance with tooling through the years was given by Charles Clark. The technical topic "Hydroforming" was covered by Kenneth Martin, who used slides and exhibits to illustrate his talk.

The hydroform process, dubbed the "big squeeze," makes pressures of up to 15,000 psi for small quantity deep draw and forming operations available to industry at a cost competitive with large volume methods.

In these new presses the workpiece is forced by the punch rising from the bottom into a neoprene flexible die member of diaphragm, which acts as a universal die, backed up on the top by an initial hydraulic pressure of up to 8,000 psi. In this manner the piece part is preformed, after which pressures up to 15,000 psi are attained by the full upward movement of the punch to complete the operation.

—E. Graser

## Metal Sales, Inc., Tour Attracts 97 ASTE Visitors

Inglewood, Calif.—A plant tour, technical session and dinner at Metal Sales, Inc., made up the May program for 97 members of the Long Beach chapter. A colored movie and actual cutting demonstrations of present flame-cutting methods were presented jointly by Air Reductions Sales and Cal Metal Sales, Inc. Speakers were William F. Hertzog and Carl B. Robinson.  
—J. J. Smith



A tour of the design department and machine shop at Alliance College, Cambridge Springs, Pa., was included on the program of the May meeting of the Erie chapter. One of the speakers at the dinner session was Nathaniel Reyburn, Applied Plastics, who talked on compression molding. More than 60 members and guests attended the meeting. Shown are: William A. Miesczak, David B. Schuler, program chairman of the Erie chapter; and Dr. A. P. Coleman, president of Alliance College.  
—W. H. Sedler



## Madison Members Honor Past Chapter Chairmen

Madison—May 21 was Past Chairmen's Night for the Madison chapter of ASTE. Among the 40 members who attended the meeting at the Top Hat Restaurant were Fred H. Kessenich, Larry Leifer, W. R. Carnes, A. G. Hoffer, and Charles W. Neff.

Coffee speaker was E. C. Helmke, chapter chairman and assistant service manager of Gisholt Machine Co., who discussed his recent three-month tour in Europe. Mr. Helmke, who was abroad when elected chapter chairman, was sworn into office at this meeting.

The technical program was presented by A. B. Riddiford, Jr., chief engineer, John S. Barnes Co., Rockford, Ill. He illustrated his discussion on hydraulic controls with movies and cut-away models.

At the April meeting Madison members honored executives from firms in the Madison area. L. E. Luberg, assistant to the president of the University of Wisconsin, spoke on "Background for Secret Intelligence." Mr. Luberg, who served in the China, India and Burma theater with the O.S.S. in World War II, told how training American industry for defense against sabotage was coordinated with the program of training individuals for intelligence work.

The 70 members and guests attending the meeting also heard talks by Dr. Justin Williams, political advisor to Generals MacArthur, Ridgeway and Clark, and Fred Lowe, delegate to the ASTE Leadership Conference and annual meeting held in Detroit. —A. J. Mergen



Madison members are pictured at the Executives Night meeting held in April.

## Annual Smoker Winds up Twin Cities' Meetings

A nontechnical program was enjoyed May 6 by 126 members of the Twin Cities chapter. Meeting at Schmidt's Brewing Co., they participated in the chapter's annual smoker.

Francis Gillette of the Minnesota Fish and Wildlife service gave a short talk on the damage to the lake trout fishing industry on the Great Lakes caused by the sea lamprey. A movie clearly illustrated the immensity of the problem and the steps being taken to combat this menace. Another film was shown on the salmon in the Columbia River. A buffet luncheon and refreshments were provided by the chapter's hosts.

—Walter J. Comstock

## South Bend Chapter Tours Oliver Corp.

South Bend—A tour of the Oliver Corp. to see the manufacture of 155 mm artillery shells was attended May 12 by 140 members of the South Bend chapter. C. W. Shider, plant manager, welcomed the group and gave a preview of the points of interest provided on the tour. The visitors followed the manufacture of the 155 mm shell from the forgings on the receiving dock through the various stages to the shipping room. Dinner was served at the Isaac Walton League clubhouse before the tour.

On May 5 the membership committee met with Chapter Chairman James Kemp to launch the South Bend membership drive. Mr. Kemp outlined the program and assigned quotas for the campaign. The committee received application blanks and literature on Society activities. Prizes will be awarded to the members who bring in the most new applicants. —Matthew J. Nowak



An overflow crowd of 170 Indianapolis members and guests was on hand May 7 to see a technicolor film "Diesel Race Car" presented by Don J. Cummins, vice president in charge of engineering, Cummins Engine Co., Columbus, Ind. Shown here, back row, are: Joe Enright, Joe Penn, Floyd Turner, Floyd Refer and Ted Harding. Seated with Mr. Cummins, center, are Duane Carter and Jimmie Daywalt, popular Speedway drivers who were guests of the chapter for the meeting.

—J. P. Enright.

## Hamilton Members Visit Steel Company

Hamilton—A plant tour and dinner at the Steel Company of Canada were enjoyed May 7 by 50 members of the Hamilton District ASTE chapter. The program also included a talk by A. D. Fisher, general superintendent, and a movie which pictured the many operations around the plant.

Mr. Fisher described the coke ovens, blast furnaces and the many miles of building necessary to produce steel. These buildings contain the open hearth, blooming mill, rod mill, continuous hot sheet mill, cold mill and electrolytic tinning operations. Over 5,000 tons of steel are produced each day at the company.

—John Litwin



Mrs. William Shaw received a silver plate at the Ladies Night festivities staged by the Hamilton District chapter in April. Clarence Bulmer, chapter chairman, made the presentation. Others pictured at the speakers table are: Mr. Shaw, past chairman; Mrs. Bulmer, Mr. and Mrs. John Snyder, and Mrs. F. C. Johnson. More than 100 couples attended the party.

### Judkins Addresses Milwaukee Meeting

Milwaukee—"Powdered Metal and Titanium" was discussed by Malcolm F. Judkins, products manager, Firth Sterling, Inc., at a meeting of the Milwaukee chapter. Coffee speaker for the program was Walter Meinhardt, Milwaukee ASTE member, who showed a color film on lion hunting in Utah and Zion National Park. More than 100 members and guests attended the session.

Mr. Judkins presented a short history of powder metallurgy and described its role in present day economy. He also covered the properties, uses and manufacture of titanium.

Among the guests at the dinner meeting was Fred Lowe, membership chairman of the Madison chapter.

—Walter Behrend

### Keene ASTE Members Hear George Morin

The April 30 meeting of the Keene co-chapter of the Twin States ASTE chapter featured a talk by George Morin, chief sales engineer, Jones & Lamson Co., Springfield, Vt. He spoke on "New Standards for Turning with Carbide."

Mr. Morin explained Jones & Lamson's research into high-speed turning of steel. They have found that turning up to 650 fpm has increased tool life, given finer finish and disturbed the steel less than at slow speeds. Grinding cracks or hardening cracks, they feel, might also be eliminated by high-speed turning.

A certificate of recognition for outstanding service was given to Past chairman Charles Hanrahan of the Keene group by Floyd McArthur, past chairman of the Twin States chapter. More than 50 members were present for the meeting held at Kingsbury Machine Tool Corp.

—Delmont J. Brown

### Positions Available

**WANTED**—Combination tooling and methods man by manufacturer of metal-cutting tools employing 200 people. Must be willing relocate in small town in Pennsylvania. Age no barrier. Give full resume past experience and salary expected in application. Reply Box 201, The Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich.

**TOOL AND MACHINE DESIGNERS**—One of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 37 W. Seventh St., Cincinnati 2, Ohio.

### L. V. Klaybor Talks on Selection of Tool Steel

North Hollywood, Calif.—ASTE ties were presented to Homer Rathbun, Louis Biegler and Ralph Sauter at the April 1 meeting of the San Fernando Valley chapter of the Society. The presentation followed a brief talk on the membership drive made by Chairman Al Beaumont.

Reports of the Society's annual meeting and Leadership Conference were given by Delegate Arthur Lewis and Alternate Delegate Rudy Regen. Mr. Biehler, the chapter parliamentarian, clarified and defined the scope of constitutional rules pertaining to the executive committee.

Guest speaker for the evening was L. V. Klaybor, association director of research, Tool and Die Steel Division of Allegheny Ludlum Steel Corp. He spoke on the selection and use of tool steel, using slides for illustration.

—C. D. Colvey

### Springfield Chapter Visits St. Louis Plant

Springfield Ill.—One hundred and twenty-seven members and guests of the Springfield chapter were guests of General Motors Chevrolet Division on May 5 to make an inspection tour of the St. Louis plant. A tape recording of some of the comments made during the trip was made by radio station WMAY for a later broadcast.

Arrangements for the radio program were made by Bates Chevrolet, Inc. Plans for the tour were made through A. F. Dames, Jr., personnel director for the plant. Field Trip Chairman was Robert Graham, and James Wharton, assistant personnel director conducted the tour.

—Charles Collier



LeRoy Rasch, far left, second vice chairman of the Springfield, Ill., chapter, congratulates J. Y. Riedel, tool steel engineer with Bethlehem Steel Co., on his informative lecture on tool failure delivered at the April meeting. With them are pictured: William Potthoff, St. Louis chapter chairman who was a guest at the session, and Earl J. Kane, chairman of the Springfield chapter.



Svend Pedersen

## Far East Expert Reviews Development of Manpower

Tucson—Meeting on the campus of the University of Arizona, members and guests of the Tucson ASTE chapter heard a talk on "Industrial and Manpower Development in the Far East" by Svend Pedersen, training supervisor of the Hughes Aircraft Co.

From 1949 to 1952 Mr. Pedersen was associated with the International Labor Office, a specialized agency of the United Nations. His work concerned development of manpower in the underdeveloped countries of the Far East. His territory of operation covered an area of more than 500 million persons—from Pakistan and Afghanistan to the Philippine Islands and from Japan to Indonesia.

Mr. Pedersen established headquarters in Bangalore in south India and organized a series of institute programs through which leaders from all of Asia could be trained in the functions of establishing and organizing manpower programs within their own countries. He explained how these programs were conducted and the problems encountered with various languages, philosophies, religions and politics.

"Natural resources of the Orient are tremendous," Mr. Pedersen said, "but it will take a great deal more technical knowledge, machinery and money to develop them than are now being employed."

—Joseph W. Vincent

## Rowley Gives Lecture

Rock Island—An illustrated lecture on "Tangent Bending" was presented at a recent meeting of the Tri-Cities ASTE chapter. Technical speaker was A. B. Rowley, Chicago manager, Struthers Wells Co., Titusville, Pa. More than 85 members and guests attended the session held at the Rock Island Arsenal.

—Earl Tenpound

# West Coast News

By Andrew E. Rylander

For some time, now, have been getting letters from members with a yen to migrate to California, especially as regards where to live. Naturally, I plug Walnut Creek although I'll have to admit that there are other places.

Anyway, none of my correspondents seem particularly concerned about making a living. They needn't be, for that matter, there still being plenty of room for trained men and particularly in our field.

What holds for California holds for the Northwest, all with bright portent for the ASTE. Portland chapter is plugging right along, with reports of good attendance and growth of membership. I knew those boys had it in them to go places so feel no surprise at this evidence of progress.

I had the pleasure of sitting in with the metallurgists at the May meeting of the American Society of Metals, where I found myself cordially received. Felt a bit strange at first, then saw Ben Berlien, Phil Freeman and several other ASTE'ers in the gathering and so felt right at home. A fine gang of men and a well attended meeting.

Golden Gate chapter's May meeting was held at the Hotel Don, in Richmond (they really get around!) where Jack Blum, plant manager of Rheem Mfg., gave an introductory talk on deep drawing of cartridge cases. After that, a tour through the plant where the boys got firsthand insight into press forging of shells and manufacture of 3 and 5-inch artillery cartridge cases. No cameras allowed, so can only give a verbal account.

The cartridge cases, drawn from a steel blank, are progressively drawn in a battery of Clearing double-end horizontal hydraulic presses, one ram drawing a case as another pulls out on its return stroke. No lost motion! Heard a hint of trouble with the presses, but that didn't sound reasonable to my ears; rather, I'd say that the trouble was with the stock being drawn. Any minute imperfection in the steel would be magnified tremendously in the process of drawing. As for that, a microscopic bit of grit getting into a die or on a punch could also score the casing surface.

For my money, the manufacturing setup was tops and Jack Blum and his fellow tool engineers deserve a lot of credit for having done so much in so short a time. He came to Rheem only a couple of years ago from the GMC

plant in Euclid, Ohio. His friends back there can be right proud of him. At the rate those cases and shells were rolling off the presses, there should be enough of ammunition going to our boys in Korea to bring the Reds to terms in a hurry. When diplomacy fails there's always the second front—American mass production.

As for production, May 25, had the pleasure of sitting in with the Golden Gate Educational Committee, held at El Curtola Restaurant in Oakland. Presiding was Wilbur D. Russel of the Inst. of Mechanical Engineering, City College of San Francisco, who succeeds Vern Gallichotte as Ch'man. Russel is taking hold in a big way, and the calibre of the Committee can be judged by those present—chapter ch'man Dave Gustafson, Vern Gallichotte, Henry De Coursey, now conducting the course in "Fundamentals of Tool Engineering" at Laney Trade & Technical Inst., Gene Rayner of Friden Calculators, and chapter past ch'men Al Minetti and Jim Coulter.

Big plans are ahead for tool engineering education in the Bay Area, and Golden Gate chapter is setting a pace that should be an inspiration to all ASTE chapters. In immediate prospect is a course in "Advanced Tool Engineering," which—subject of course to the approval of the Bd. of Education—would supplement the present fundamentals and also a course in design now conducted by Louis Talamini. Louis is an old-timer with much experience; worked together with him as a tool designer at International Type-setting; Brooklyn, back in 1912.

One thing brought out at the meeting was that there is a critical shortage of tool designers in the Bay Area; seems the schools aren't turning 'em out fast enough to meet demand. Not that this is a hint for tool designers to leave good jobs in the Middle West—like the shoemakers, they're better off sticking to their lasts—but it does indicate the need for training in both design and tool engineering. Give us time, and the cooperation of industry and education, and we'll get there.

Apropos education, the course in tool engineering at San Jose—cosponsored by Santa Clara Valley chapter—seems to be going over in a big way. There, too, good men are in there pitching, all evidence of the seriousness with which California tool engineers are furthering the science of making things.





Pictured at the May meeting of the Twin States chapter are: C. J. Cameron, second vice chairman; Marty Parker, first vice chairman; C. L. Sadon; George Julian, chairman; W. E. Fraser and E. M. Brown, secretary.

## Explains Manufacture of Jet Engine Parts

Springfield, Vt.—Speakers at the May meeting of the Twin States chapter were Charles L. Sadon, manufacturing engineer, and Warren E. Fraser, development engineer, General Electric Co., Lynn, Mass.

In his talk on tooling and manufacture of jet engine parts, Mr. Sadon stressed the need for extremely close tolerances and hard-to-machine materials because of high air speed and extreme heat. He cited the blades or buckets as being one of the biggest problems.

Because all parts must be interchangeable, GE has set very close controls on the inspection of parts. All tools and gages used in the manufacture of jet parts are color coded, each color indicating a definite date that the gage or tool must be reinspected or

reset by the inspection or standards department. A movie on jet propulsion accompanied Mr. Sadon's talk.

Mr. Fraser spoke on the machineability of heat-resistant materials and pointed out experiences and difficulties encountered in the machining of stainless steels, Timken alloy, inconel, vitalium and titanium. A film entitled "U. S. Motors" was shown after the technical session. —Maurice E. Blais

## Albuquerque Members Hear Dr. A. O. Schmidt

Albuquerque—Dr. A. O. Schmidt of Kearney & Trecker Corp., Milwaukee, was the featured speaker at the May 12 meeting of the Albuquerque ASTE chapter. Close to 50 members and guests attended the dinner session held at the Fex Club.

Dr. Schmidt presented an account of experimental work on milling cutters and applications of the principles learned in the laboratory to actual working conditions. He stressed accurate cutter grinding prior to use as one of the most important prerequisites to good milling. —H. E. Anderson

## Hold Joint Meeting with Industrial Engineers

Peoria—A joint dinner meeting with the Society of Industrial Engineers was held April 28 by the Peoria ASTE chapter. Technical speaker for the evening was Marvin E. Mundel, director of management engineering training program, Army Ordnance Corps, Rock Island. He spoke on time standards as applied to Army Ordnance Corps training and showed slides on the training program now in progress. Claire Turner was technical chairman.

New members of the chapter include Clifford Gillett, Elmer Widby, Wifford Thannert and students Donald Keil, Donald Meyer and William Schuler.

Student officers for the year are Richard Atterberry, chairman; Richard Masters, first vice chairman; Dave Early, second vice chairman; Robert Johnson, secretary; Dan Williamson, treasurer; and Duane Brighton, advisor.

—Russ Saur



The program at Peoria chapter's April meeting, sponsored jointly with the Society of Industrial Engineers, was presented by Marvin E. Mundel, second from left, director of the management engineering training program at Rock Island Arsenal. Shown with him: Claire Turner, ASTE technical chairman; Wesley Leveek, SIE program chairman; and Richard Streitmiller, ASTE program chairman.

## Crosby and Ruder Visit Wichita Chapter

Wichita—A Kansas welcome was given May 13 to national ASTE officers Joseph Crosby, first vice president, and E. H. Ruder, chairman of the National Public Relations Committee, when they were guests of the Wichita chapter. The meeting included a tour of Wichita Air Base facilities, followed by dinner served at the Officers' Club.

With U. S. Air Force Officers as guides, 150 Wichita ASTE members and their guests were given nonrestricted information on operations at the base and told the flight characteristics of the B-47.

In his address to the group, Mr. Crosby encouraged the adoption of chapter-sponsored programs to train engineers for the aircraft industry in the Wichita area. He also described national ASTE activities in the standards and research fields.

Other events of the program included the first display of the chapter's new ASTE banner and the presentation of a brief case to Past Chairman Orville Strahm in recognition of his outstanding service last year.—John G. Temple

## Granite State Hears Talk on Electroplating

Portsmouth, N.H.—The current season of chapter activity for Granite State ASTE members was climaxed May 12 when they heard a technical address by Hubert M. Goldman of Enthone, Inc. The dinner meeting was held at Yoken's Restaurant.

Mr. Goldman's subject was "Practical Information for Various Electroplating and Chemical Finishing Operations." A miniature plating apparatus was used to demonstrate a few electroplating operations. —C. P. Radwan

## Obituaries

**Howard C. Sechrest**, president of Howard Machine and Welding Co. and a charter member of the Madison ASTE chapter, was killed April 18 when his plane crashed in a snow squall near Dansville, N. Y. He was an active member of the Society and had served on the chapter's board of directors for two years.

Mr. Sechrest was a veteran pilot who had flown his own plane since 1929. He was a delegate to the 1953 House of Delegates and had flown to Detroit for the annual meeting.

**Walter P. Zagar**, an immigrant from Austria who built Zagar Tool, Inc. into a million-dollar operation with 130 employees from a modest 1939 start in a machine shop in his garage, died April 23 at the Cleveland Clinic. He was 65.

The growth of his company was a story of family cooperation. Mr. Zagar had been a White Motors Co. machinist for 25 years when he got an order for a special machine.

"How about my pitching in with you?" asked his son Frank. The whole family tackled the project, and remained active in the company. His wife, Rosalia, helped too, and won national distinction during World War II when she was chosen "Woman of the Week in War Industry."

Mr. Zagar was a member of the Cleveland chapter of ASTE and also belonged to the Cleveland Tool & Die Association.

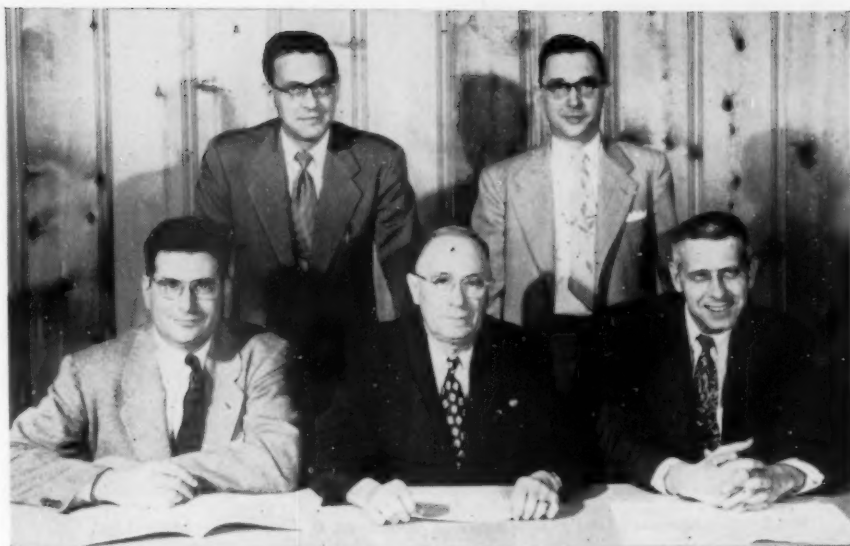
## Dayton Chapter Marks Fifteenth Anniversary

Dayton—The fifteenth anniversary meeting and party put on May 11 by the Dayton chapter was attended by 75 members and guests, including a large number of past chairmen. Among them were Earl Johnson, H. O. Poock, Gordon Letsche, Walter Olt, E. J. Seifreath, George A. Goodwin, George C. Tillotson, Russell Miller and R. M. Blair.

After dinner, served in the Empire Room of the Miami Hotel, Chairman R. A. Miller conducted a short business meeting and introduced several presentations by professional entertainers. The chapter also saw a film entitled "Harnessed Lightning" which had been produced for the Allison Division of General Motors Corp.

An informal address was made by Tom Blackburn, coach of the University of Dayton basketball team, who gave an off-the-record discussion of his past and present teams.

—W. J. Killinger



Officers of the Lima ASTE chapter are, seated: R. E. Fromson, first vice chairman; A. E. Feightner, chairman; and W. J. James, secretary. Standing: H. W. Carey, second vice chairman; and J. E. Kuck, treasurer.

## Lima Celebrates First Anniversary

Lima—The first anniversary of the Lima ASTE chapter was celebrated May 8 when 176 members and guests marked the evening with a dinner dance at Springbrook Gardens. Cutting of the two-tier birthday cake, topped with a lone candle, was a highlight of the evening. Music was provided by Karl Beach and his orchestra. Out of town members present were from Upper Sandusky and Coldwater.

At the May technical session, Mel Verson, executive assistant, Verson All-steel Press Co., Chicago, showed films

climaxed with a plant tour of the Construction Equipment Division, Baldwin Lima Hamilton Corp. More than 150 members and their guests took the three-hour tour, viewing the tooling, construction and assembly operations on the shovels, cranes and stone crushers manufactured by the firm.

A feature of the tour was the visit to the Betatron, the 24-million volt X-ray machine, one of twelve in the country. It is housed in a separate building which has six-foot thick concrete walls as a protection against radiation.

On April 16 the chapter heard a talk by Harry W. Stewart, chief engineer, Logansport Machine Co. He dealt with the application of fluid power to machine tools. Slides illustrated his discussion.

—Donald H. Cox



Chairman Feightner presents the past chairman's pin to R. J. Schimpf, 1952-53 chapter chairman.

on presses and tooling at Maytag, transmat presses and tooling, and hot extrusions and forgings in transmat presses. A lively question and answer period followed the program.

New members of the chapter were introduced. They are: R. D. Pennell, Russell Kruse, John Raines, Richard E. Shaw and H. A. DePree.

The chapter's April activities were

## Saginaw Valley Tours AC Spark Plug Plant

Flint, Mich.—Some 250 members of the Saginaw Valley chapter participated in the recent plant tour of the AC Spark Plug Division of General Motors Corp. The visitors were welcomed by Howard Roat and then conducted through the press department where transfer presses, progressive dies and many other high production press metal presses were in operation.

The tour also included the new instrument assembly line which was in operation using the new power free conveyor. Dinner was served before the visitation. Program arrangements were made by Nick Bereznoff.

—Ben Phillips



Students observe plant operations at Giddings & Lewis Machine Tool Co.

## 100 High School Seniors Participate in Fond du Lac's Student Guidance Program

Fond du Lac—The second annual Student Guidance program of the Fond du Lac chapter was held on May 13, with more than 100 high school seniors and their instructors from fourteen Wisconsin cities participating. The students toured the four plants of the Giddings & Lewis Machine Tool Co., in the afternoon and heard a talk by E. L. McFerren, vice president and chief engineer, who outlined the duties and responsibilities of the engineer in industry.

The dinner program held at the Elks Club was attended by 150 persons, including the chapter guidance committee, the industry sponsors, the students and their instructors.

W. E. Rutz, executive vice president of Giddings & Lewis, was toastmaster. He introduced the featured speaker, Dr. John Jacobs, manager of the Advance Development Laboratory X-ray Dept., General Electric Co., Milwaukee.

The purpose of the Student Guidance program is to encourage graduating high school students to enter the engineering profession in general and tool engineering in particular. Besides the formal program, various industry sponsors are available to the students for consultation during the year.

Sponsors are: Valley Iron Works Co., Appleton Machine Co., Appleton; Brillion Iron Works, Inc., Brillion; Giddings & Lewis Machine Tool Co., Tobin Tool and Die Co., Fond du Lac; Hudson-Sharp Machine Co., Packer Mfg. Co., and Cleerman Machine Co., Green Bay; John Deere-Van Brunt & Co., Horicon; Kaukauna Machine Corp., Kaukauna.

Other companies sponsoring student activities are: Kaufman Mfg. Co., Aluminum Goods Mfg. Co., Manitowoc Eng.

Corp., and Manitowoc Co., Inc., Manitowoc; Meili-Blumberg Corp., New Holstein; Wisconsin Axle Division, Oshkosh; Eclipse Mfg. Co., Vollrath Co., Polar Ware Co., Sheboygan; Hamilton Mfg. Co., Paragon Electric Co. and Metal Ware Corp., Two Rivers; and H. D. Hudson Mfg. Co., and Standard Oil Co. of Indiana, West De Pere.

Arrangements for the program were made by the Student Guidance Committee. Serving on this all-important committee are: Chairman H. J. Van Valkenburg, Co-Chairman Robert Brecklin, G. E. Tegen, H. C. Soukup, G. B. Wertsch, John Bahr, G. E. West, Wayne Rowan, E. F. Ziller, F. J. Lohr, William Jorgenson, Gideon Kane, Jule Schommer, Charles Schenschak, Donald Storms, Lynton Kirby, and Clarence Rau.

At the April meeting the chapter heard a talk by S. J. Stehberg, John Deere-Van Brunt Co. He spoke on the effects of a quality control in operation and how it affects shop personnel. He told how quality control can improve quality by increasing worker responsibility and pride in his work.

—Robert M. Hanson

## Fred Cowell Appointed Manufacturing Executive

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The visitors assembled in the plant auditorium to see a film titled "What is Cold" which explained the principles of refrigeration and how they are applied to electric refrigerators. After the movie, small groups of ASTE members were conducted through the plant and offices.

Covering an area of ten acres, the plant has a production capacity of 400 electric refrigerators, 200 electric ranges and 75 ice cream cabinets a day. A moving conveyor system,  $4\frac{1}{2}$  miles long, moves the various parts of the appliances to their respective assembly and finishing stations. To speed up receiving, loading and shipping in car-load quantities, a company-owned diesel locomotive operates on more than two miles of company-owned track.

In the porcelain plant, an automatic pickling machine, the largest of its type in the world, aroused keen interest, as did the preparation of porcelain for application in an underground mill room. Also of interest was the method of firing porcelain in ovens operating at a temperature of 1500 degrees Fahrenheit.

Other highlights of the tour included an automatic seam welder, which welded refrigerator bodies, and batteries of spot welders used to fasten various panels and attachments to the bodies. The pressroom and toolrooms were, naturally, of interest to the visitors. The design of various dies came in for close scrutiny.

After the tour refreshments were served in the plant cafeteria.

—A. McKinney Rice

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"The committee accepted the resignation with reluctance and voiced appreciation of Mr. Slezak's valuable services in planning the research efforts of our national technical society. However, the committee is proud of the fact that one of its members has been selected for this extremely important position in the Defense Department," Mr. Conrad said in announcing the resignation.



## Chicago Executive Speaks on Gears

Aurora, Ill.—A talk by the president of Industrial Gear Mfg. Co., Chicago, John A. Sizer, was heard by about 70 Fox River Valley members at a recent meeting. Mr. Sizer spoke on the various strains and stresses set up in a normal pair of running involute spur gears and told how they are increased when gears are not manufactured correctly, or when center distances vary or when eccentricity of gears is great. He was assisted by W. H. Wakefield and C. J. Auth.

Coffee speaker at the dinner meeting was L. E. Markle, who described a recent trip to the Hawaiian Islands he made with a special committee under the direction of the Secretary of the Navy. Colored slides illustrated his talk.

—Donald E. Zierke

## Monarch Representative Discusses Metal-Cutting

Nashville—A talk on metal-cutting and the machine tool industry was heard April 21 by the Nashville ASTE chapter. Speaker at the dinner meeting was S. E. Beer, Monarch Machine Tool Co., Sidney, O.

In his discussions Mr. Beer gave a complete description of the air tracer attachment on Monarch lathes, and its usefulness as an instrument for better production and economy. After the lecture a film entitled "Pattern for Profit" was shown. A lively discussion period, nearly an hour long, concluded the program.

Among the guests attending the technical session was G. T. Richardson, regional sales manager for Noland and Co., Chattanooga.

—Joseph Sharpe

## Prof. Richardson Speaks to Lehigh Valley Group

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Prof. Richardson spoke on the value of industrial engineering, stressing the importance of coordination between the industrial engineer and the tool engineer. He emphasized the need for motion analysis of the operation in relation to the tool design, and stressed simplification of load and unload.

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Donal Kohler greets Joseph P. Crosby, ASTE first vice president.

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Gerald Sick, first vice chairman, introduced the past chairmen and related their contributions in building the Rochester chapter. They were: John Bartek, Charles Codd, John Dense, Cecil Lucas, Clifford M. Sears, Joseph Schick, Chauncy Newton, Earl DeBisschop, Charles E. Seeley, Milton Roessel, Herbert Simon, William R. Gordan, Emmet Moore, James O. Horne, and Charles De Martin.

A short talk on human relations in business was made by Lanni Forini of the Dale Carnegie staff. The meeting was held at the Barnard Exempt Assoc.

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Among those guests attending the program were: Roger F. Waindle, national president of ASTE; James Garfield Stewart, Justice of the Supreme Court of Ohio; Carl W. Rich, mayor of Cincinnati; and Burnham Finney, editor of *American Machinist* magazine.

The major address was delivered by Mr. Finney who spoke on "What's Ahead in Tool Engineering." In his forecast of the immediate future, Mr. Finney's most startling prediction centered about the importance of reducing down time in automation. He predicted that within the next decade, machine tools would be designed to automatically index into working position, sharp cutting tools to replace the dull ones.

Mayor Rich extended the best wishes of the official family of Cincinnati and recounted several incidents from high school days when he attended classes with Mr. Finney. Justice Stewart, the only honorary member of the Cincinnati chapter, spoke briefly on his favorite topic "Fellow Tool Engineers."

In his talk, Mr. Waindle presented a summary of the status of the Society and gave a glimpse of what is planned for the coming year.

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## Contour Turning Topic for Potomac Program

Washington, D.C.—The final meeting of the current season was held in May by the Potomac ASTE chapter. More than 130 members were present and witnessed the presentation of the gavel, made from wood from recent White House alterations, to the chapter chairman.

The technical program was presented by Richard Montanus, vice president and chief engineer, Springfield Machine Tool Co., Springfield, O. He spoke on contour turning, comparing the various basic ideas and advantages of each method.

Guests at the meeting included Capt. B. R. Harrison, USN; Col. R. M. Williams, USA; William Pierce, Fibre Glass Corp., and G. Lafferty of Toledo.

—F. E. Bellin

## O'Connell Speaks on Verson Allsteel Presses

Dallas—About 100 members of the North Texas chapter were on hand May 15 for a technical meeting held at the Engineers' Club. Guest speaker was Emmett J. O'Connell, director of public and industrial relations, Verson Allsteel Press Co., Chicago.

Color movies were shown of various transmat presses, producing intricate parts through each operation and stage of fabrication. The machines shown were equipped with a feeding system which automatically transfers the part through each operation.

Other films showed the manufacture of the Maytag washer, and a new method of hydroforming with the Verson Wheel on press.

A guest at the meeting was Harold Verson, works manager of the Dallas-Texas Div. of Verson.

—E. P. Simpson



Clarence H. Adams, right, Cone Automatic Machine Co., was the technical speaker at the May 13 meeting of the Fort Wayne chapter. He was introduced by Blaine I. Garard, left, first vice chairman. The coffee talk was delivered by Prof. W. B. Hill of Purdue University. —Richard G. Spaw.

### Assistant Professor

needed to teach lecture and laboratory courses in four year degree curriculum in Tool Engineering. Should have professional degree and be familiar with manufacturing processes and tool design. Write directly to:

Prof. Frederick Preator  
Department of Tool Engineering  
Utah State College  
Logan, Utah

## Walter Rollins Addresses Mohawk Valley Meeting

Herkimer, N.Y.—Fifty-five members of the Mohawk Valley chapter of ASTE heard a talk April 28 by Walter Rollins of Brown and Sharpe Mfg. Co. He described special and standard tooling for his company's automatic screw machines, illustrating his talk with films. The technical session and dinner which preceded it were held at the Prospect Hotel.

—E. Merkelbach

## Education Night Held for High School Seniors

Los Alamos—A panel discussion on "Tool Engineering as a Profession" was presented for high school seniors at the Education Night meeting held May 13 by the Los Alamos ASTE chapter. Darriel Morgeson acted as moderator. Other participants were: Frank Black, Oliver Heustis, Gerald Rogers, Robert Kee, Hannibal Varga, Howard Hathaway, H. Von Steeg, and Bernard Pohlman.

A copy of the *Tool Engineers Handbook* was presented to Donald C. Roush, principal of the Los Alamos High School, for the school's library.

—H. J. Von Steeg

## GM Engineer Talks on Automobile Styling

St. Catharines, Ont.—George T. Christianson, styling engineer, General Motors Corp., Detroit, was the technical speaker for the May 7 meeting of the Niagara District chapter held at Welland House. His subject was "Styling the General Motors Car." About 70 members and guests were present for the meeting.

Mr. Christianson said that it takes approximately two years to design and tool up for a major body change. Styling has become increasingly important in selling automobiles, he said. In 1927 GM employed 200 persons in the styling and design department; today there are more than 500.

—W. A. Yaeget



C. R. Staub, center, of Michigan Tool Co., was the speaker at a recent New Orleans meeting. With him are Joe Cimo and L. V. Graham.

## Directory of ASTE Chapter Chairmen

- AKRON No. 47, Third Tuesday,** Frank A. Flannery, 211 Edgerton Rd., Akron, Ohio
- ALBUQUERQUE No. 93, First Friday,** Harold P. Baecker, 1721 Ridgcrest Dr., Albuquerque, N. M.
- ATLANTA No. 61, Third Monday,** Charles D. Toney, Jr., 774 Dill Ave., S.W., Atlanta, Ga.
- BALTIMORE No. 13, First Wednesday,** Donald E. Wernz, 1214 Register Ave., Baltimore 12, Md.
- BINGHAMTON No. 35, First Wednesday,** Howard D. Berthoff, 46 Matthews St., Binghamton, N. Y.
- BOSTON No. 33, Second Thursday,** Wilfred B. Wells, 94 Walnut Hill Rd., Chestnut Hill 67, Mass.
- BUFFALO-NIAGARA No. 10, Second Thursday,** William J. Ickel, R.F.D. 1, Springville, N. Y.
- CEDAR RAPIDS No. 71, Third Wednesday,** Richard L. Coyner, 119 Rapids Ave., S.W., Cedar Rapids, Iowa
- CENTRAL PENNSYLVANIA No. 22, First Wednesday,** Raymond H. Meckley, R.F.D. 1, Red Lion, Pa.
- CHAUTAQUA-WARREN No. 108, Third Thursday,** R. J. Wilson, Jr., Sylvania Prod. Co., Warren, Pa.
- CHICAGO No. 5, First Monday,** Harry A. Paine, Federal Machine Sales, 4639 Washington Blvd., Chicago 44, Ill.
- CINCINNATI No. 21, Second Tuesday,** Richard B. Niebusch, 3921 Woodford Rd., Cincinnati 13, O.
- CLEVELAND No. 3, Second Friday,** Gordon W. Carlton, 1910 Seneca Dr., Euclid 17, Ohio
- COLUMBUS No. 36, Second Wednesday,** Emmett A. Bartlow, 2080 Riverside Dr., Columbus 12, O.
- DAYTON No. 18, Second Monday,** Richard A. Miller, Economy Tool & Die, P.O. Box 127, Dayton 10, Ohio
- DECATUR No. 58, Next to last Thursday,** Robert Serr, Forrest Knolls Est., Decatur, Ill.
- DENVER No. 77, First Thursday,** C. J. Helton, 61 S. Cherokee, Denver 9, Colo.
- DES MOINES No. 80, Third Wednesday,** Geo. F. McMaster, 304 Hillside W., Des Moines, Iowa
- DETROIT No. 1, Second Thursday,** Michael Pinto, Douglas Tool Co., 3437 Golder Ave., Detroit 10, Mich.
- ELMIRA No. 24, First Wednesday after second Tuesday,** Edwin Chas. Bates, 111 Oakwood Ave., Elmira Hts., N. Y.
- ERIE No. 62, First Tuesday,** Harry M. Rudd, 2717 Cascade St., Erie, Pa.
- EVANSVILLE No. 73, Second Monday,** Paul W. Vierling, Benerson Corp., 418-424 N. Willow Rd., Evansville 20, Ind.
- FAIRFIELD COUNTY No. 6, First Wednesday,** Richard W. Smith, 141 Edgell Rd., Fairfield, Conn.
- FOND DU LAC No. 45, Second Friday,** Erwin J. Kaiser, 530 E. Division St., Fond du Lac, Wis.
- FORT WAYNE No. 56, Second Wednesday,** Donald D. Welbaum, 2318 Wayne-Wood Dr., Ft. Wayne 6, Ind.
- FOX RIVER VALLEY No. 72, First Tuesday,** Philip C. Shaner, 203 N. Washington, Batavia, Ill.
- GOLDEN GATE No. 28, Third Wednesday,** David A. Gustafson, 2765 Argyle St., Oakland 2, Calif.
- GRAND RIVER VALLEY No. 81, First Friday,** John Ward, Can. General Tower, 52 Middleton St., Galt, Ont., Can.
- GRANITE STATE No. 86, Second Tuesday,** Jacob J. Repetto, Clarostat Mfg. Co., Washington St., Dover, N. H.
- GREATER LANCASTER No. 89, Third Tuesday,** Raymond C. Moorhead, 1912 Sterling Pl., Lancaster, Pa.
- GREATER NEW YORK No. 34, First Monday,** Hartley W. Barclay, New York Times, 229 W. 43rd St., New York, N. Y.
- HAMILTON No. 42, Second Friday,** Clarence E. Bulmer, 43 Whitton Rd., Hamilton, Ont., Can.
- HARTFORD No. 7, First Monday,** Omer A. Gingras, Pratt & Whitney Div., West Hartford, Conn.
- HOUSTON No. 29, Second Tuesday,** Harmon O. Traughber, 302 Norwood, Houston 11, Tex.
- INDIANAPOLIS No. 37, First Thursday,** Joe Penn, 526 Mills Ave., Indianapolis 27, Ind.
- JACKSON No. 87, Third Monday,** Theodore Vickers, 726 Griswold St., Jackson, Mich.
- KANSAS CITY No. 57, First Wednesday,** Merlin R. Grundy, 2600 Somerset Dr., Kansas City 5, Mo.
- KEYSTONE No. 101, First Thursday,** Jack Lipman, 439 Irving Ave. N., Scranton, Pa.
- LACROSSE No. 96, Fourth Tuesday,** Edward J. Giroux, 1035 S. 19th St., LaCrosse, Wis.
- LEHIGH VALLEY No. 83, Third Friday,** John D. Folwell, 614 N. St. Elmo, Allentown, Pa.
- LIMA No. 97, Third Thursday,** A. E. Feightner, R.F.D. 1, Elida, O.
- LITTLE RHODY No. 53, First Thursday,** Fred W. Kunath, 29 Taylor St., Cranston, R. I.
- LONDON-ST. THOMAS DISTRICT No. 91, Third Thursday,** Louis Jensen, Kelco Eng., Ltd., 352 Thames St., London, Ont., Can.
- LONG BEACH No. 84, Second Wednesday,** Carlyle E. Blanchard, 5760 Appian Way, Long Beach 3, Calif.
- LONG ISLAND No. 88, Second Monday,** Arthur Cervenka, Vanderbilt Blvd., Oakdale, L. I., N. Y.
- LOS ALAMOS No. 92, First Wednesday after second Tuesday,** Robert H. Moller, 2146A 43rd St., Los Alamos, N. M.
- LOS ANGELES No. 27, Second Thursday,** Carl L. Almquist, Almquist Bros., 2300 E. 49th St., Los Angeles 58, Calif.
- LOUIS JOLIET No. 104, Third Tuesday,** Harry J. Moffat, Caterpillar Tractor Co., Joliet, Ill.
- LOUISVILLE No. 54, Second Tuesday,** Robert F. Lenz, 3127 Eagle Pass, Louisville 13, Ky.
- MADISON No. 75, Third Thursday,** Edward C. Helmke, Gisholt Mach. Co., 1200 E. Washington, Madison 10, Wis.
- MEMPHIS No. 105, Second Friday,** Albert T. Hicks, Hays Machine Tool Co., 269 So. Front, Memphis, Tenn.
- MID-HUDSON No. 74, Second Tuesday,** Stanley P. Cook, Vassar View Rd., Poughkeepsie, N. Y.
- MILWAUKEE No. 4, Second Thursday,** Eugene J. Anspach, Line Material Co., 700 W. Michigan St., Milwaukee 2, Wis.
- MOHAWK VALLEY No. 78, Fourth Tuesday,** Earl K. Wheat, 301 Otsego St., Iilon, N. Y.
- MONTREAL No. 50, Second Thursday,** Charles A. Gareau, 1080 Crevier Ville, St. Laurent, Que., Can.
- MUNCIE No. 70, First Tuesday,** Norman E. Hines, 2106½ So. Washington St., Marion, Ind.
- NASHVILLE No. 43, Third Tuesday,** Warren A. Thornberry, General Machine Co., 715 12th Ave. So., Nashville 4, Tenn.
- NEBRASKA No. 103, Third Thursday,** Joe A. Duncanson, P. O. Box 148, Seward, Neb.
- NEW HAVEN No. 41, Second Thursday,** Emanuel Edw. Lull, Crucible Steel Co., 131 Park St., New Haven, Conn.
- NEW ORLEANS No. 60, First Tuesday,** Leslie B. Graham, 4994 Montegue, New Orleans, La.
- NIAGARA DISTRICT No. 65, First Thursday,** Albert A. Clarkson, 154 S. Dr., St. Catharines, Ont., Can.
- NORTHERN MASSACHUSETTS No. 100, Third Tuesday,** Glen H. Stimson, Greenfield Tap & Die Co., Sanderson St., Greenfield, Mass.
- NORTH TEXAS No. 51, Second Friday,** Jimmie E. Franklin, 705 N.W. 9th St., Grand Prairie, Tex.
- NORTHERN NEW JERSEY No. 14, Second Tuesday,** William E. Wheaton, 915 W. 6th St., Plainfield, N. J.
- PATERSON No. 102, Charles M. Bazas, 272 Maryland Ave., Paterson, N. J.**
- PEORIA No. 31, First Tuesday,** Raymond J. Zimmerman, Box 91, Roanoke, Ill.
- PETERBOROUGH No. 94, First Thursday,** Leendert Hansier, 624 Donegal St., Peterborough, Ont., Can.
- PHILADELPHIA No. 15, Third Thursday,** C. R. Pittsinger, 210 Montgomery Ave., Orelana, Pa.
- PHOENIX No. 67, First Monday,** Chester W. Vermilyea, Motorola Research Lab., Phoenix, Ariz.
- PIEDMONT No. 82, Second Monday,** Edward Neal Dietter, Crucible Steel Co., P.O. Box 2402, Charlotte, N. C.
- PITTSBURGH No. 8, First Friday,** Lawrence J. Brozek, 2508 Collins Rd., Pittsburgh 35, Pa.
- PONTIAC No. 69, Third Monday,** Hilton V. Phipps, Cutting 11, Supplies, 88 S. Cass Ave., Pontiac, Mich.
- PORTLAND, ME., No. 46, Second Friday,** Faye B. Taylor, 18 Birch Ln., R.F.D. 4, Portland, Me.
- PORTLAND, ORE., No. 63, Third Thursday,** Melvin S. Nielsen, 9043 N. W. Leahy Rd., Portland 1, Ore.
- POTOMAC No. 48, First Thursday,** George M. Beck, 7917 Kentbury Dr., Bethesda, Md.
- RACINE No. 2, First Monday,** Wallace E. Swan, Racine Tool & Machine Co., 1760 State St., Racine, Wis.
- RICHMOND No. 66, Second Tuesday,** R. H. Culbertson, 11 S. W. 5th, Richmond, Ind.
- ROCHESTER No. 16, First Monday,** Donald F. Kohler, 240 Vanvoorhis Ave., Rochester 17, N. Y.
- ROCKFORD No. 12, Second Thursday,** William Moreland, 3304 Minnesota Ave., Rockford, Ill.
- SAGINAW VALLEY No. 68, Third Thursday,** Donald A. McMillan, 3316 Court St., Saginaw, Mich.
- ST. LOUIS No. 17, First Thursday,** Willis J. Potthoff, Route 2, Box 64, Graesser Road, Creve Coeur, Mo.
- SALT LAKE CITY No. 85, Second Friday after 1st Wednesday,** Frederick Preator, 530 N. Third, East Logan, Utah
- SAN DIEGO No. 44, Second Tuesday,** Arthur E. Crom, 1759 Oliver Ave., San Diego 9, Calif.
- SAN FERNANDO No. 99, First Wednesday,** Rudolph Regen, 4523 Fulton Ave., Sherman Oaks, Calif.
- SAN GABRIEL VALLEY No. 95, First Thursday,** Peter Carter, Rain Bird Sprinkler Mfg. Corp., 19233 E. Foothill, Glendora, Calif.
- SANTA CLARA No. 98, Third Tuesday,** William C. Lanyon, 104 Oak Hill Way, Los Gatos, Calif.
- SCHENECTADY No. 20, Second Thursday,** George S. Nelson, 315 Florida Ave., Amsterdam, N. Y.
- SEATTLE No. 39, Fourth Tuesday,** Roy A. Coady, 6559 43rd Ave., N.E., Seattle 5, Wash.
- SOUTH BEND No. 30, Second Tuesday,** James L. Kemp, 909 Sherman, South Bend 16, Ind.
- SPRINGFIELD, ILL. No. 64, First Tuesday,** Earl J. Kane, 200 S. MacArthur Blvd., Springfield, Ill.
- SPRINGFIELD, MASS. No. 32, Second Monday,** Robert M. Dickson, 29 Maybrook Rd., Springfield 9, Mass.
- SPRINGFIELD, OHIO No. 76, Second Tuesday,** Richard C. Montanus, Signal Hill Rd., Springfield, Ohio
- SYRACUSE No. 19, Second Tuesday,** Robert D. Fulford, 309 Melrose Ave., Syracuse 6, N. Y.
- TOLEDO No. 9, Second and fourth Wednesday,** Joseph J. Kertz, 4554 Willys Parkway, Toledo 12, Ohio
- TORONTO No. 26, First Wednesday,** Dave R. J. Few, 85 Northline Rd., Toronto, Ont., Can.
- TRI-CITIES No. 23, Second Wednesday,** Gilbert H. Jording, 2015 42nd St., Rock Island, Ill.
- TUCSON No. 106, Second Tuesday,** James D. Beach, 5828 Nogales Hwy., Tucson 2, Ariz.
- TULSA No. 90, Second Thursday,** Lester W. Williams, 717 So. Marion, Tulsa, Okla.
- TWIN CITIES No. 11, First Wednesday,** Carl E. Fasth, 2700 29th Ave., N. E., Minneapolis 18, Minn.
- TWIN STATES No. 40, Second Wednesday,** George Julien, 26 Smith St., Springfield, Vt.
- WATERLOO AREA No. 79, Third Wednesday,** Gerald E. Osworth, Tecumseh Products, Tecumseh, Mich.
- WESTERN MICHIGAN No. 38, Second Monday,** Harry J. Swanson, Swanson Machine, 1422 Lake Dr., S. E., Grand Rapids 6, Mich.
- WICHITA No. 52, Second Wednesday,** Ambrose A. Reddy, 430 S. Vine, Wichita, Kan.
- WILLIAMSPORT No. 49, Second Monday,** William J. McCoy, 316 E. Central Ave., S. Williamsport, Pa.
- WINDSOR No. 55, Second Monday,** John F. Johnston, 30 Thomson Blvd., Riverside, Ont., Can.
- WORCESTER No. 25, First Tuesday,** John Edw. Rotchford, Loding, Inc., 73 Beacon, Worcester 2, Mass.

# News in Metalworking . . .

## LARGEST GEAR SHAVER IN THE WORLD

Problems of reduction gearing have assumed considerable significance with the increased turbine speeds required by the engines in ships' power plants today. Much larger gears are needed and, at the same time, even greater importance is attached to precision in gear characteristics. National Broach & Machine Co. now has climaxed earlier developments in this field by building the world's largest shaving machine which will handle gears with up to 180-inch PD, and, with certain modifications, work gear diameters could be increased to 200 inches.

This particular shaver was built for

degrees with that axis. When positioned, they are locked to the top of the front base and the forward side of the rear base.

The headstock is a heavy, rigid, one-piece casting equipped with a larger spindle for larger work gears, and a second for smaller units. Change gears which control the spindle speeds are arranged so that when either is operating, the other is inoperative. The headstock carries its own 25 hp drive motor housed in its base.

Operating on hardened and ground ways, the saddle is self-contained and equipped with its own enclosed 2-speed

A vertical arm at the forward end of this bar carries two gaging buttons at its lower end which actuate a dial indicator above. One of these buttons is used to check journal alignment on a vertical plane; the other checks alignment on a horizontal plane.

After the work gear is loaded and its shaft aligned, one of the cutters is advanced into mesh with the work gear. With the work gear driving the cutter, the latter moves across the face of the work gear. At the end of its traverse, the rotation of the work gear is reversed and an increment of infeed is set manually by the operator. The cutter then moves back across the face of the work gear to complete its stroke. At the end of a predetermined number of strokes, the machine is stopped.

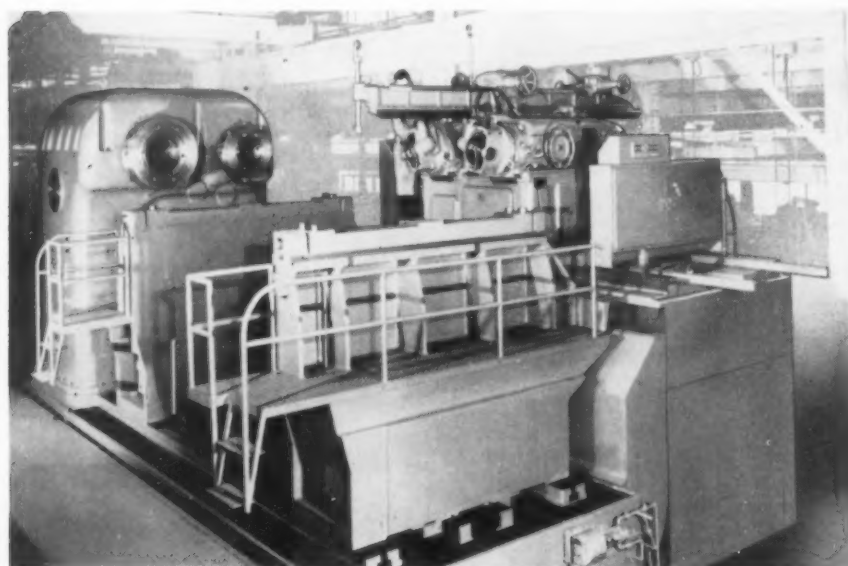
Taking into consideration the size of the gears to be worked on by the giant tool, designers built into it features which eliminate extra handling. Once the gear is in shaving position, it may be completely finished without further handling. All principal structural elements are solid, heavily ribbed castings rather than fabricated plate to insure precision, exact and consistent positioning and alignment. This was done to avoid even the slightest deflections since precision work is essential.

## SILICON WHEELS TO SAVE DIAMONDS

A resin-bonded silicon carbide grinding wheel for toolroom use has been developed as an economy measure to consume critically scarce and expensive diamond wheels. The grinding wheels are already being produced in large quantities by Electro Refractories & Abrasives Corp. here, which pioneered the development. Carl F. Leitten, vice president of production, said it may be used to grind both the shank steel and the carbide with a greater depth of cut. In some cases, he stated, it has replaced the diamond wheel in grinding shank steel. In others, it supplants two vitrified wheels.

Investigation into details reveals a special blend of resins for the bond was formulated for cool cutting characteristics. This eliminates overheating of the carbide and the threat of cracking of expensive tools.

The technique for grinding with the silicon carbide wheel is different from that with the diamond wheel. The operator must learn how to use the new wheel correctly. Silicon carbide wheels are used most generally in industry for rough grinding and cutting.



horizontal axis shaving with the work gear rotating and located in journal bearings just as it is when finally assembled in its reduction unit. Approximately 115 tons in weight, the machine is 24 ft long, 25 ft wide, and towers 18½ ft above its concrete foundation.

The base consists of two parts rigidly locked together with trussed spacers. Two adjustable pedestals and the stationery work-drive headstock are carried on the front part, and the saddle assembly, which may be power positioned anywhere within its 137-inch traverse range, is carried on the rear part. Journal bearings of the two pedestals hold the work gear shaft which is driven through a flexible coupling by the headstock spindle. Each pedestal has a front journal bearing for large work gears and a rear bearing for smaller units. Both pedestals may be power traversed in line with the work gear axis or may be adjusted at 90

reversing drive motor. The unit includes cutter head slides and journal checker. It is traversed in both directions under push-button control. Pressure lubrication is provided to all necessary points. The large saddle feed screw, anchored at both ends, remains stationary. Lubrication of the power feed screw nut is provided by a separate constant-level oiling device.

Two cutter slides, with a journal alignment checker between them, are included in the cutter head assembly. Power traverse brings each cutter slide quickly into approximate shaving position with the work gear. Both cutter heads have precision, antifriction spindles. The crossed axis setting of each cutter head is made by an adjustment crank and vernier scale; a dial indicator is used for final setting.

Work gear journal alignment is checked by means of the checking bar carried between the cutter head slides.



## SEMINARS INFORM ENGINEERS ON HIGH-SPEED CUTTING

Believing that machine tool users are generally employing obsolete standards for metal-cutting, the Jones & Lamson Machine Co. has been conducting seminars each month to acquaint tool engineers with the possibilities and advantages of high-speed cutting. These meetings show engineers what can be done to improve their present methods and how to increase production.

At a recent meeting before a group of engineers from the Milwaukee area, a high-speed movie was shown to illustrate chip formation and the effects of cutting speeds. These movies, taken at 3000 frames a second, show the cutting action for speeds up to 1000 surface feet per minute. At the lower speeds, the chips are shown thickened with considerable distortion as they leave the workpiece. At higher speeds the chips thin out with lessened distortion. At no speed could the metal be seen parting from the cut ahead of the point of the cutting tool which has been a popular conception.

### Present Research Results

Included at each session is a review of the research and development program conducted by J & L on the influence of cutting speed, feed, and tool rake and clearance on cutting forces, surface finish, surface deformation, size control and tool wear. A rule of thumb criterion has been evolved with respect to cutting speeds: If the finish does not have a fine sheen, the cutting speed is probably not fast enough.

With respect to cutting forces, demonstrations with a dynamometer show that, for rake angles between minus 10 and plus 10 degrees, the tangential and feed loadings on the tool decrease markedly up to speeds in the range of 600-700 surface feet per minute. The reason for the higher tool pressures at lower speeds results from distortion of the material of the workpiece. Photomicrographs demonstrate that speeds of 1000 feet per minute cause no noticeable distortion of the surface on a workpiece of forged 8620 steel.

Results of research on chip breakers have indicated that effective performance may be obtained with a standard 0.0020-inch depth, the width and radius varying according to the feed and material being cut. For nose radii from  $\frac{1}{16}$  to  $\frac{1}{8}$  inch, the chip breaker width varies from 0.050 to 0.122 and the fillet radius ranges between 0.035 and 0.090 inch.

### Revue Studies on Titanium

Machining of titanium and the results of recent studies are also discussed at the seminars. Rake angles

for the best cutting conditions fall either at minus 5 or plus 10 degrees. The poorest performance is obtained with a positive angle of 5 degrees.

### Tour Shows Examples

In addition to other studies including grinding of carbide tools and cutters, standardization of tool shapes, economics of tool life, and threading operations and its tooling, a trip through the shop showed these practices in opera-

tion. Noteworthy were a ram-type turret lathe machining bolts of 1315 steel at 720 feet per minute, and a heavy turning operation at 600 surface feet on a  $3\frac{1}{2}$ -inch bar turret.

Eleven of these monthly conferences have been held at the J & L plant in Springfield, Vt. The group at each meeting is from a single industrial area, and includes from 15 to 40 engineers. When interests of the engineers are diversified, the groups are kept small, so that each individual may have a better opportunity to obtain specialized information.

## Cut Costs in Large Hole or Deep Hole Drilling with **WAUKESHA** *Inserted Blade* **SPADE DRILLS**

**WAUKESHA Inserted Blade SPADE DRILLS** are low in first cost. Further, each size of tool holder accommodates blades with diameter variations up to  $\frac{1}{2}$  inch. One holder does many jobs.

And the **WAUKESHA Spade Drill** body lasts for years and years. Like your safety razor you replace only the blade when finally worn out. **WAUKESHA Inserted Blade SPADE DRILLS** are the most practical tools for turret lathe and deep hole drilling. Both types of **WAUKESHA SPADE DRILL** Holders have coolant holes which assure an ample supply of coolant to flush out chips. Try **WAUKESHA SPADE DRILLS** in your plant. Order one today.

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Standard sizes from 1-1/32" to 5" in constant stock. Orders for special sizes or special types (such as rear piloted and short length spade drills) are given immediate attention.

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## REDESIGN AND ALUMINUM COMBINE TO SAVE WORK

One of the requisites in a tooling program at Northrop Aircraft's Hawthorne, Calif. plant is an ingenious type of drilling fixture. The program calls for a device to drill new attach angles in modified wings with hole patterns that match the old exactly. Since existing holes are blind, it is almost impossible to match them by conventional means. Further complicating the problem is the fact that the hole patterns must be duplicated within 0.001 inch tolerances. Each hole is drilled at a different angle, and up to 60 holes must be duplicated on each new angle.

By interdepartmental cooperation an ideal solution to the problem of how to make a fixture for the job was reached. The tool design, tool engineering and tooling machine shop coordinated their efforts with Pioneer Tool Engineering, Inc., to build the fixture in a month.

It is, roughly, a pantagraph-type fixture which locates, by pin, the rivet



holes in the old attach angle, and transmits the position and angle through a bushing to the new angle.

Aluminum tooling plate was the material chosen for the fixture since it offered a combination of advantages. It is free-machining, cuts as fast as wood, and is easily drilled, tapped and ground. Already machined to a plus/minus 0.005-inch flatness, it needs no surfacing. A cast material, it is dead and hence shows no tendency to "walk out." With no strains setting up to cause it to move out of position after being set, no normalizing is needed.

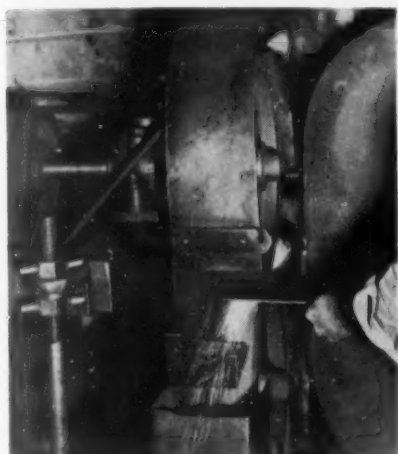
Currently, the new duplicator is saving hundreds of hours of labor monthly. Mechanics find it simple to operate. They merely bolt on the new and old attach angles; drop the pin into the hole in the old angle, adjusting it until it falls free; tighten the fixture; drill through the bushing to make the rivet holes in the new angle. Errors are almost impossible, and the 0.001-inch tolerances are easily held.

## TWO-BELT GRINDING DOUBLES OUTPUT

Production finishing rate of carpenter squares was doubled for one midwest manufacturer through an ingenious arrangement of commonly used equipment. Two coated abrasive belts are set up to run over vertically opposed contact wheels. Both sides of the flat metal were thus ground simultaneously.

Previously, the squares were offhand polished on abrasive coated setup wheels. The original objective in converting from setup wheels to coated abrasive belts was to take advantage of the better finish produced and the reduced cost in operation possible with belts. The double belt machine was a subsequent development.

The machine, as first set up by the product engineers of Behr-Manning Corp., manufacturer of coated abrasives,



consists of two coated abrasive belt grinders mounted in one frame and driven by one electric motor. The bottom belt runs vertically and the top belt runs horizontally. Rubber rimmed contact wheels support the belts where they contact the work and act as belt drive wheels. Two backstand idler pulleys, one in the frame base and one on the rear frame, maintain belt tension.

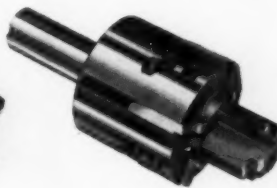
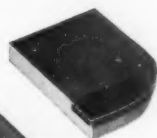
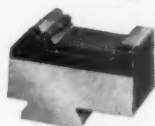
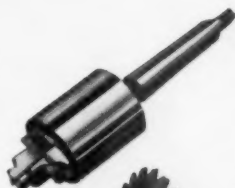
Center distance between the two contact wheels is fixed to maintain a gap between opposed abrasive belts equal to the final desired thickness of the square. However, the frame is adjustable to permit changes in center distance for grinding thicker or thinner stock.

Since the same four V-belts from the motor drive both contact wheels, both contact wheels run counterclockwise (as viewed from right side) at the same speed. With wheels of equal diameter the surface speeds of the belts are equal. But at contact points, the belts are moving in opposite directions. This balances the thrust or pull on the square being ground and permits the operator to retain full control of the work.

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# Tools of Today . . . .

## Metal Fabricator

This heavy-duty Wales fabricator has a 27-inch throat depth with back gage installed and 30½-inch throat depth without back gage. This deep throat press permits the punching of holes in over a greater area in large workpieces.

The punch assembly holder arm swings to the right for quick interchangeability of punches, reducing setup time and increasing the output of parts from hours to minutes and, in some cases, to seconds. The punches and dies are automatically aligned by this holder which permits holes to be punched up to 3½ inches in diameter. With each punch, a set of dies is provided to meet the requirements of various types of metal and various thicknesses of stock. Accurate gaging is provided by an easily adjusted back and side gage with built-in scales which insure close tolerance hole locations.

This Wales model 10-C sheet metal fabricator with a large 56x37-inch



work table provides level support of large workpieces and permits convenient left-to-right feeding and stacking with a minimum of motions for small workpieces.

Nibbling around guide plates is practically an automatic operation on the Wales fabricator by positioning the nibble lever, at the right side of the ram housing, to provide continuous operation of the ram.

One of the features of the Wales fabricators is the Hydra-new-matic head which operates with a minimum of vibration and noise at 165 strokes a minute. This head is revolutionary in its simplicity of design and operation. Full-floating drive shaft construction places ram load, by means of main bearings, directly on the frame proper, eliminating all bending stress on drive shaft.

A built-in counter placed at eye level automatically totals strokes of ram. The nonrepeat trip lever must be depressed for each cycle of the ram action.

For information on this Wales 10-C fabricator, write to the Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y. for Catalog 10-C.

T-1-1041

## NEW Dial Bore Gages

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at machine as well as  
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Available from smallest model  
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checking 48 inch bore.

Speed up production; reduce  
scrap; save time; save \$\$\$.  
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### Demagnetizer

It is established practice to use a demagnetizer as an aid to better production through the removal of loose metal filings, chips, etc. from the edges of cutting tools. This model D-3 is a demagnetizer that can be used for a wide variety of work, large and small.

To demagnetize small items, such as cutting tools, etc., the item is drawn slowly back and forth across the poles of the model D-3 and then slowly drawn away. For larger parts, or in cases where it is not convenient to move the part, the model D-3 can be held upside down by its convenient handles and passed over the part until its entire surface has been exposed. Switch and pilot light are at one end, next to the handle.

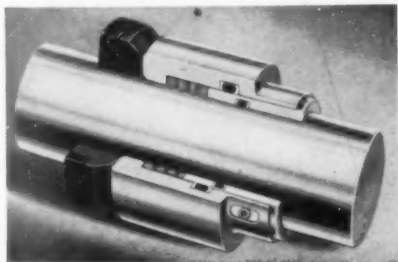
For information, write the Martindale Electric Co., 1375 Hird Ave., Cleveland Electric Co., 1375 Hird Ave., Cleveland.

**T-7-1051**

### Mechanical Seals

Simplicity of design is a feature of Garlock's O ring mechanical seals for rotating pump shafts. The small number of parts affords easy manufacturing adaptability of this improved seal to withstand any liquid, whether mild, harmfully corrosive or extremely hazardous, on rotating pump shafts.

These O ring seals are designed to provide leakless operation of rotary shafts on centrifugal pumps handling chemicals, petroleum products, edible



liquids, pulp liquors, and many other liquids. They are furnished in type O, an unbalanced seal for pressures up to 200 psi and in type OB, a balanced seal for pressures up to and over 1,000 psi. Both types can be supplied with single spring or multiple spring, and in either pin-drive or sleeve-drive construction.

Type O seals are furnished for packing spaces  $\frac{1}{16}$  inch and larger. In some cases, type O seals can be made for  $\frac{1}{4}$  inch packing space. Type OB seals are furnished for packing spaces  $\frac{3}{8}$  inch and larger.

The O rings are available in Teflon, Buna-N, Neoprene, or Silicone. The metal parts contacting the liquid can be furnished in any suitable metal. For additional information, write The Garlock Packing Co., Palmyra, N. Y.

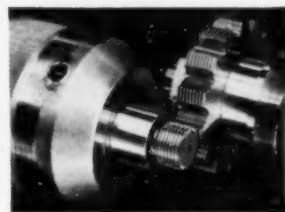
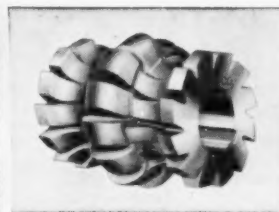
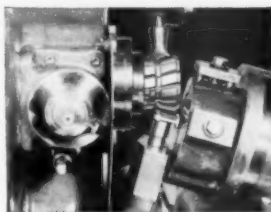
**T-7-1052**

## SPECIALLY DESIGNED Form Milling Cutters REDUCE MILLING COSTS



### Get Peak Milling Efficiency with Special Form and Accuracy

Using special equipment and years of experience, Barber-Colman cutter engineers accurately develop and reproduce special forms on form-relieved cutter teeth to assure consistent duplication and accuracy in successive milling cuts. Forms are projected against 50 to 100 times size engineering layouts to check exact tolerances. Accuracy of form is maintained the full length of the cutter teeth, with close tolerances held on tooth indexing to permit cutters to be sharpened on automatic sharpening machines.



### Accurate Unground Cutters

New techniques and heat treating methods enable you to take advantage of unground cutters in maintaining unusual production accuracy. These special form-relieved cutters control accuracy, finish and form automatically, making the job easier and more economical. Tool costs are reduced and set-up greatly improved.

Try Barber-Colman form-relieved cutters on your next production milling job and experience the satisfaction of fewer operations, simplified tooling, faster production and trouble-free machining.

**SEND US PRINTS OR SAMPLES FOR ANALYSIS**

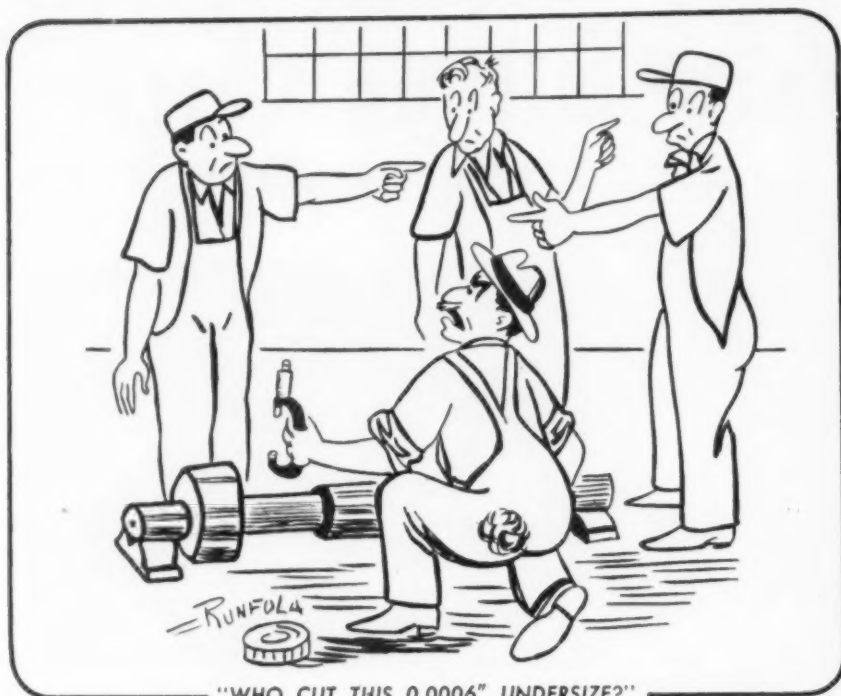


## Barber-Colman Company

GENERAL OFFICES AND PLANT,

8107 ROCK STREET, ROCKFORD, ILLINOIS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-105



Reprinted with permission of the American Machinist

## DO YOU NEED A "PUTTIN'-ON-TOOL"

for salvaging undersize parts, worn tools  
and gages right in your own plant?

Now, with the Chromaster industrial chrome plating unit, you can restore undersize components or worn tools to exact dimensions, easily and simply, in a matter of minutes. With Chromaster, you will be able to salvage thousands of dollars worth of material you're now throwing into the scrap bin.

Here are the facts about Chromaster:

- **SIMPLE TO OPERATE**
- **NO PREVIOUS PLATING EXPERIENCE NEEDED**
- **FAST DEPOSIT RATE. .002" per hour**
- **CHEMICALLY STABLE PLATING SOLUTION**
- **LOW PLATING COST . . . only 7 mills per sq. in. .002" thick**

Now take a look at a few of the actual savings the Chromaster has made in other plants.

### ACTUAL CHROMASTER SAVINGS

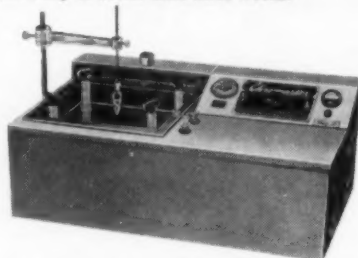
A CHICAGO TOOL COMPANY with 1500 shafts ground undersize used a Chromaster to return

them to their original size with a surface finish of greater wear resistance.

A PHILADELPHIA MANUFACTURER used Chromaster to correct an oversized cylinder bore by plating to size.

A BROOKLYN FOUNDRY saved two grinding operations and almost five hours in plating time on every component with Chromaster.

A CALIFORNIA AIRCRAFT FACTORY salvaged expensive worn-down reamers with Chromaster. The new plating increased their useful life from less than a day to better than three weeks.



### A CHROMASTER FOR EVERY SHOP

Model A-20 is a 20-amp, bench-mounted unit for the gage room or tool crib; plates up to 10 sq. in.

Model A-50, 50-amp, bench-mounted unit for larger shops in plating of cutting tools. Plates up to 25 sq. in.

Model A-250, 250-amp, floor-mounted unit for production plating of small parts in greater quantities or larger parts with areas up to 125 sq. in.

# Chromaster

Write for money-saving free  
information today

A-3-3

Industrial Chrome Division  
Ward Leonard Electric Co.  
15 South Street  
Mount Vernon, N. Y.

Please send me information  
on industrial chrome  
plating with CHROMASTER.

COMPANY

NAME

TITLE

ADDRESS

CITY

ZONE

STATE

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-106

## Crucible Melting Furnace

The new Sentry electric furnace shown here is the firm's Model YV designed for laboratory and shop operations where it is desirable to melt small crucible charges of various metals and alloys.

This compact unit is easily accessible and will maintain temperatures of 2500° F. The fact that the furnace is equipped with a cylindrical muffle chamber materially reduces the tendency of fumes resulting from the melting operation from entering the furnace heating chamber and adversely affecting the heating element life. Provision is also made for venting fumes through the door when closed. Heating is accomplished by 4 silicon carbide rod-type resistors operating direct from a 220 volt supply. Accurate temperature control is maintained by automatic pyrometer control equipment.

The Model YV is one of a complete line of electric heat treating furnaces made by The Sentry Company of Foxboro, Massachusetts. **T-7-1061**

## Motor Control

The Servospeed Div. of Electro-Devices, Inc., 4-6 Godwin Ave., Paterson, N.J., has introduced a line of electronic variable speed motor control systems. The redesigned units up to and including 3-hp models now make use of special terminal block transformer construction, special cabinet design for



wall or bench mounting and critical component plug-in assemblies.

New electrical design utilizes the motor series field as a torque signal source in a patented feedback circuit to provide constant system torque capability. Controlled acceleration on many models allows use in applications of high inertia loads without placing excessive torque load on materials in critical processes.

Fingertip controlled models for manual speed selection at remote points are available, as well as a line of automatic servospeed systems for use in various industrial operations or processes.

**T-7-1062**

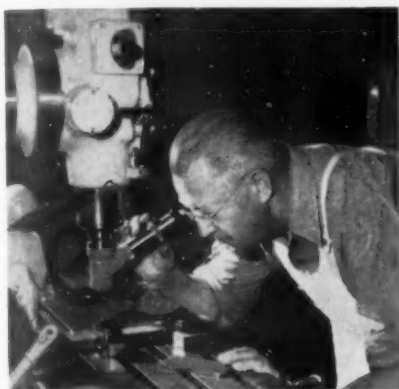
USE READER SERVICE CARD ON PAGE  
133 TO REQUEST ADDITIONAL TOOLS  
OF TODAY INFORMATION



## Microscope

The model 11 machine tool locating microscope providing 30X magnification, great enough to see 0.0001 inch, is now in production by The Perkin-Elmer Corp., Norwalk, Conn. When attached to a machine tool such as a jig borer or a vertical milling machine, it aids the machinist in checking contours, slots and surface conditions which cannot be accurately checked by mechanical measuring instruments. It is especially suited for work where holes are too small and contours too irregular to approach with an indicator.

Designed to be mounted directly in the machine spindle or on an offset bracket, the locating microscope can be adapted to nearly any machine tool. A



roof prism is incorporated into the optical system to erect the image. Thus, all table movements made by the operator appear to be in the true direction when observed through the eyepiece.

The microscope has a wide field of vision that includes a full 1/4-inch of the workpiece. This simplifies picking up a reference point and enables the operator to visualize the relationship of various contours of the parts. The focussing eyepiece is set at a convenient angle from the optical axis, for ease of viewing.

The microscope greatly simplifies machining of parts from template layouts. It often permits precision well beyond those possible in the average milling machine by eliminating lead screw inaccuracies and other machine adjustments. It will not destroy the template during machining.

In precision grinding or boring, the microscope can check the trueness of rotation of the part to be ground or bored before the operation starts.

The microscope components are assembled in a cast aluminum housing, which is light in weight, rugged and compact.

Bulletin 0-2 describing the model 11 machine tool locating microscope may be had by writing The Perkin-Elmer Corp., Norwalk, Conn. **T-7-1071**

## Here are the KEYS to MORE PRODUCTION

### VLIER FIXTURE KEYS

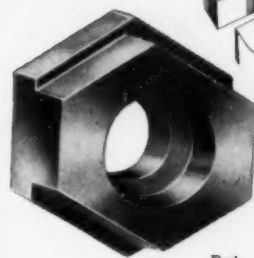
*In these simple tools you  
find the answer to elimi-  
nating fixture and key  
rework, faster production  
and less idle machine time.*

**VLIER Multi-dimensional Fix-  
ture Keys** are counter-bored  
nuts that are milled to different  
cross-dimensions.

With these keys on your fix-  
tures, a job can be worked on  
any idle machine without loss  
of time. Accuracy is guaranteed  
to  $\pm .0005"$  and there is a type  
to meet your needs in the  
VLIER line.

#### MILLED SLOT FIXTURE KEYS

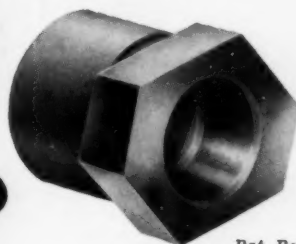
This type is designed to fit all  
standard table slots. Since each  
key fits three table slot dimen-  
sions, many combinations are  
possible. To use, simply loosen  
cap screw, rotate to desired  
dimension, tighten and you are  
ready to go. Available in six  
sizes or special sizes on request.



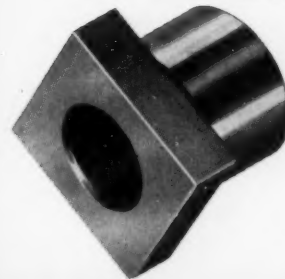
Pat.

#### REAMED HOLE FIXTURE KEYS

For use where the economy of  
reamed hole installation instead  
of milled slots in the fixture is  
desired without sacrificing  
accuracy. Supplied in four sizes  
and three types... hex,  
rectangular or square.



Pat. Pend.



**VLIER ENGINEERING, INC.**

4552 BEVERLY BLVD., LOS ANGELES 4, CALIFORNIA

Distributors of Spring Plungers, Torque Thumb Screws, Toggle Pads, Spring Stops.

Send for Catalog No. 53

# Etch Iron, Steel or their Alloys



**IDEAL Electric  
ETCHERS**

## Easy to Use as a Pencil!

Burns a permanent mark right into metal. Pays for itself many times over in time and money saved! Dozens of uses in every plant... marking stock, parts numbers, sizes—Brinell and Rockwell hardness—model numbers—inventory data—identifying tools, dies, jigs, parts. More reliable than tags, far cheaper than special plates. Always ready for use—portable—safe! "Universal" model (shown); four etching heats—120 to 700 watts. Others for medium, large or small work.

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CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

INDICATE A-7-108-1

## Steel Coating

The Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn., announces a Black Magic S.S. process for blackening stainless steels, cast and malleable irons. Black Magic S.S. is a one salt mixture, one bath process operating at a temperature of 255 to 260 F.

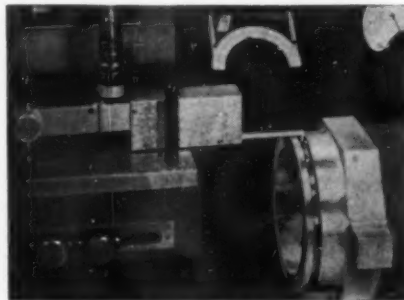
Black Magic S.S. produces a lustrous, adherent black finish on stainless steels, cast and malleable irons which will not chip, flake or peel. Immersion time in the blackening solution is from 5 to 15 minutes.

Black Magic S.S. is a very economical and inexpensive finish to apply. The cost of application for chemicals is less than 1/4 cent per square foot. The parts to be finished can be processed in baskets and in a few cases should be racked. A large amount of work can be processed in a relatively small volume of Black Magic S.S. blackening solution.

The blackening solution is made up by using 5 to 5 1/2 lb of Black Magic S.S. blackening salts for each gallon of solution and in this proportion will give a boiling point of 255-266 F. T-7-1081

## Profilometer Tracer

Micrometrical Mfg. Co. announces the profilometer type KB tracer for measuring surface roughness across the bottom of flat-bottomed grooves to 1/4-inch depth and behind shoulders to 1/4-inch height. When measuring crosswise, it permits 1/16-inch length of trace in grooves of 5/32-inch width, the greater length of trace in wider grooves. This tracer can also be used

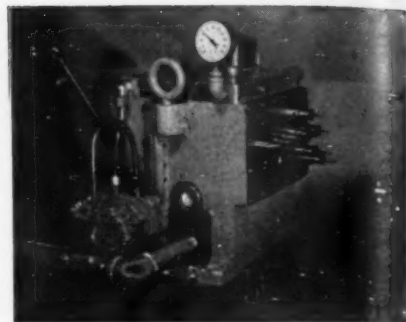


in ID's from 25/64 inches to flat, and on all OD's and flats, where the part can be mounted on a linear pilotor with the work surface horizontal.

To permit reaching down into grooves and over shoulders, this tracer has no skids, and the tracer point is at the bottom of a vertical extension at the end of a long beam. This construction requires that the tracer be supported and moved mechanically by a linear pilotor.

Full details and specifications are given in bulletin LT76, available on request from Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich.

T-7-1082



An ultra precision multi-spindle head of a unique design adaptable to an Excellor, Heald or Stoker-Unit Horizontal-Precision Boring Machine.

One ten thousandth tolerance on diameters of bores and plus or minus one ten thousandth tolerance on center distance between bores.

These special heads will cut your direct labor costs and increase production per machine.

Send in your inquiries for further information.

Designers and manufacturers of tools, dies, gages, fixtures, special machines, optical checking equipment and precision instrumentation parts.



**PIONEER TOOL & ENG. CO.**

3914-18 W. Shakespeare Ave.

Chicago 47, Illinois

INDICATE A-7-108-2

## Taper Attachment

The Dow taper attachment developed and manufactured by Associated Engineers, Inc., utilizes and improves the taper turning ability of standard turret lathes, using the combined feeds of the hex turret and cross-slide.

The attachment consists of two units. The first is a roller bracket which is mounted in the square tool turret or on the cross-slide; the second, and most important unit is an adjustable cam, mounted on a holder, fitted to the stand-



ard hex turret and is so located as to allow the cam to contact the roller in the tool post.

The first step in turning tapers or angles will be to select the cross-slide and hex feed which will most nearly produce the desired angle. The second step is to adjust the cam to compensate for the difference between the angle which the machine can produce and the angle to be cut.

As the two feeds are engaged simultaneously with the cam in contact with the roller, a rolling action results. This changes the lateral movement of the tool while the cross-slide travel remains constant, thus increasing or decreasing the angle between the axis of the work and the path of the tool depending on which direction cam is rotated.

Because the cam is infinitely adjustable, the range of angles which can be cut by the Dow taper attachment is likewise infinite within the range of the machine. This range is as follows:

The practical minimum angle is approximately that which can be produced by combining the maximum longitudinal feed of the hex turret with the minimum cross-slide feed. The maximum is 90 degrees with the axis of the workpiece. Using the Dow taper attachment, angular surfaces can be machined internally or externally on either the

periphery or face of the workpiece.

The following advantages are claimed by the manufacturer when using this attachment: Single point turning will eliminate necessity for making a set of form tools. It will produce a better finish in less time as heavier cuts can be taken. The speed and depth of the cut, and thus the stock removal, can be as great as in conventional turning. More than one angle can be cut in a single setup by using two or more attachments in the hex turret, each set for a different angle. The maximum angle with axis of work is not limited as with ordinary attachments. Angular facing operations, either internal or external, are performed with ease.

Standard turning or facing tools are used, eliminating the initial cost of tools as well as maintenance. The work is subject to less strain by a single point turning than with forming operation.

On fragile parts this could be a decisive factor in the selection of tools and methods. Friction is negligible as the force exerted by the cam on the roller actually helps the cross-slide feed do the work. The Dow taper attachment is easily adapted to different sizes of machines. All turret lathes having power feeds on both hex turret and cross-slide can use the Dow taper attachment, become more versatile, often eliminating the necessity for secondary operations on other machines. Simplicity of setup and operation adapt this tool for skilled and unskilled help alike.

For further information, write to Products Department Associated Engineers, Inc., Box 1628, Springfield 1, Mass. T-7-1091

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

### FRAY TOP SLIDES

### DOUBLE MILLING RANGE

*Fray* NO. 10RH MILLING MACHINE  
UNIVERSAL RAM • TURRET TYPE  
• VERTICAL & HORIZONTAL

A Fray pays bigger production dividends by performing an unequalled range of milling operations. Both of the top slides on the Fray 10 RH are easily adjustable. This feature permits alignment of the turret slide with the table, thus doubling longitudinal and cross milling range . . . or you can just as simply set the turret at an angle to the table and mill in two directions. Combined, the turret slide and table slide provide 38" of overall travel, while the table cross slide, plus the ram slide permits a full 18" of in-and-out adjustment. This equals the overall range of much larger machines. Fray moves precision work faster at less cost.

Overall Height 7 Feet

Write for details and specifications  
Request Bulletin # 10

Fray "All-Angle" Head TYPE 4

For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4.

## FRAY MACHINE TOOL CO.

515 WEST WINDSOR ROAD, GLENDALE 4, CALIFORNIA



## Bench-Type Mill

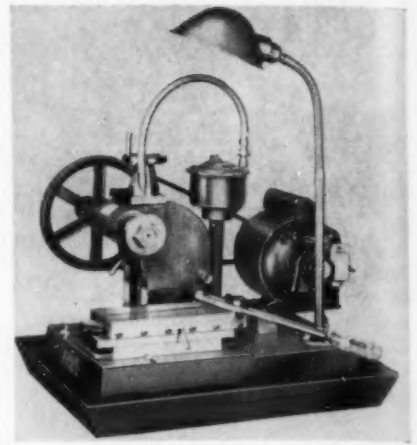
A bench-type mill, adaptable to a wide range of light milling operations, is announced by Viking Industries, 220 Montague St., Rockford, Ill. The model is designed to do precision work and cut production costs on jobs often assigned to larger mills.

Adaptable for varied jobs, the Viking Mill can be used for making key ways, slotting, splitting, squaring at different angles, milling flat spots on small shafts, spline cutting, small screw slotting, and many other similar applications. Interchangeable pulleys make possible a wide range of speeds up to 7,000 rpm. The complete unit is light and easily

portable. Base dimensions are 11 x 18 inches.

All integral parts of the mill are finished to precision limits. A heavy-duty, precision-type spindle mounted on heavy ball bearings assures accurate, noiseless operation. The spindle is designed with a  $1\frac{3}{32}$  inch through hole and No. 7 Brown & Sharpe taper for mounting arbors, shanks, and adaptors. To insure efficient operation and increase belt life, pulleys are accurately balanced and closely inspected to prevent vibration and chatter. Powered with a  $\frac{1}{8}$  hp, single-phase motor, the mill operates on standard 110 v, 60-cycle ac.

A precision set-up block measuring



$3\frac{1}{2} \times 9 \times \frac{3}{4}$  inch high is machined with key-ways on top and bottom at right angles. A single slide table having large dovetail ways and adjustable gibs permits 4 inch travel with plastic handle lever and has an adjustable stop at both ends to limit travel. A  $\frac{1}{2}$  or 1-inch arbor and draw bar are used for end mill holders and arbors. The completely assembled mill is also equipped with a self-contained motor-driven coolant pump designed to operate efficiently with all types of water soluble coolants.

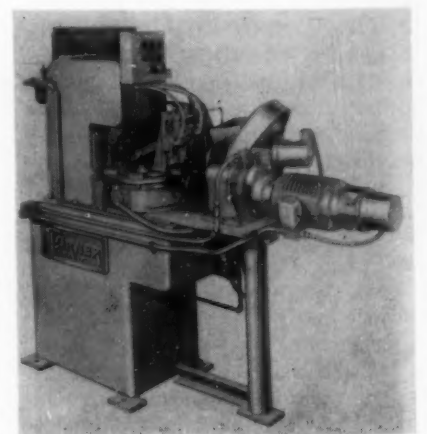
**T-7-1101**

## Automatic Machine

The manufacture of a specially designed automatic drilling, assembling and crimping machine has been announced by Turner Bros., Inc., 2625 Hilton Road, Ferndale, Mich.

The machine has been engineered and constructed for the automatic hopper loading of breather nut, insertion of baffle, crimping of baffle, drilling of nut and automatic ejection. It was stated that the machine had been designed to economize on floor space in addition to saving on manpower.

**T-7-1102**



USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

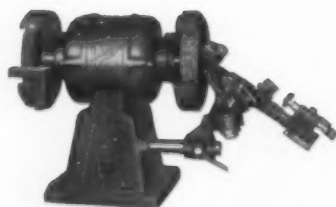


Drill Grinder with  $\frac{3}{8}$  inch capacity holder on left and  $2\frac{1}{2}$  inch on right side. Can also be furnished with a general purpose grinding wheel on left end instead of the small drill holder. Also available for wet grinding.

## A POINT TO REMEMBER

A drill point that is sharp and correctly ground will—

- (1) drill to exact size
- (2) drill faster
- (3) drill more holes per grind
- (4) require less power
- (5) reduce breakage
- (6) cost less to regrind
- (7) increase life of drill as less metal is removed each time drill is sharpened.



Bench type Drill Grinder with  $\frac{3}{8}$  inch capacity holder. Also made in  $1\frac{1}{4}$  inch capacity Pedestal type.

It naturally follows that a Drill Grinder will quickly pay for itself in increased production and lower cost direct and indirect labor.

**Write for catalog 72 EG today!**

**Hisey** THE HISEY-WOLF MACHINE CO.  
CINCINNATI 3, OHIO  
Division of The Cincinnati Electrical Tool Co.

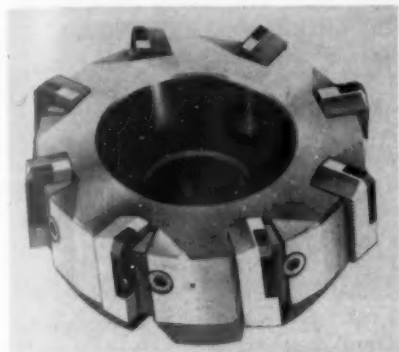
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-110

### Shell End Mills

Included now in the Super Tool Co. line of standard carbide cutting tools are inserted blade shell end mills for steel, cast iron, and nonferrous metals.

Blades are quick-replaceable, serrated-back design with carbide tips and are secured with minimum stress by wedges which distribute holding pressure along the entire length of the blade.

Both cutters are engineered to make machining of these metals more eco-



nomical by providing greater durability and ruggedness in body and blade construction.

The cutters for steel are designated as type DBSS and are available from stock in 4, 5, 6, and 8-inch diameters.

The cutters for cast iron are designated as DBS and available from stock in sizes 3 to 8 inches inclusive.

Replaceable blades are also stocked for both cutters in suitable carbide grades. Bulletins describing the cutters in greater detail may be obtained by addressing Super Tool Co., 21650 Hoover Road, Detroit 13. T-7-1111

### Micrometer Head

The Boeckeler Instrument Co., 29 East Rillito Street, Tucson, Arizona, announces that it is now distributing in the USA the Tavannes non rotating



spindle micrometer head made in Switzerland by Tavannes Machines Co., S. A.

This head has a one-inch range, and reads by vernier to 0.0001 inch. It is used as standard equipment on the Boeckeler Model No. 1 optical micrometer and is now available for general mechanical and electronic applications.

T-7-1112

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

If your tooling problem involves

# AUTOMATIC FLOW CONTROL



... headquarters for  
automatic flow-control engineering

to stop, start,  
measure, meter,  
throttle, regulate  
or  
to control temperature,  
pressure, level,  
expansion of  
air, gases, liquids  
or refrigerants

Automatic throttling and  
expansion valves  
Solenoid valves  
Pressure-limiting valves  
Thermo-electric valves  
Aircraft valves  
Refrigerant valves  
Valves for automatic control of  
gas or liquid flow

Regardless of what your problem may be — whether it involves liquid, gases, air or refrigerant — consult our engineers. Chances are one of the many standard A-P valves will solve your particular problem. If not, we'll work with you to design and build a special control to match your need.

## A-P CONTROLS CORPORATION



**DEPENDABLE Controls**

2402 N. 32nd St. Milwaukee 45, Wisconsin

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-111

# KELLER Air Tools

*for high speed assembly*



ANOTHER EXAMPLE OF  
KELLER Air Tools engineered to industry

Wherever parts are assembled with screws, nuts, bolts or rivets, the use of Keller Tools speeds up production, reduces costs, and makes work easier.

For example, in assembling record players (shown above), changing to Keller Air Tools made the work easier and faster, and substantially reduced production costs.

## FACTS IN BRIEF

ABOUT KELLER PNEUMATIC SCREW DRIVERS

*Interchangeable parts*

*Reduce operator fatigue*

*Clutches, socket drivers, 45° and 90° attachments for every purpose*



Send for  
**FREE 36-Page Booklet**  
for more information and interesting  
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Keller Tool Company, Grand Haven, Mich.

Please send me a free copy of your booklet on  
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-112



*Weight less*

*Consume less air*

*Need fewer "back-up" parts in the tool room*

*Wide variety of handles, gearings, torques, speeds*

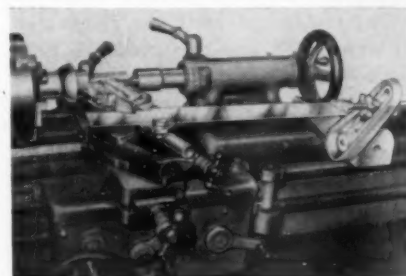
## Duplicating Attachment

The Lehigh Pro-Tracer is a profile tracing attachment, so designed that it is virtually foolproof and break-down free. It is ideal for runs too short to warrant the setup time necessary when using long run equipment, yet its heavy duty construction enables small shops to produce sizable quantities of turnings, impossible previously because of limited facilities, according to the maker.

All models are precision-built and constructed with ample strength margins to permit use on three-shift production runs when this is desirable.

Installation or removal takes only a few minutes, and no alterations to the lathe are necessary. The tool post is removed and a single bolt securely fastens Pro-Tracer to the compound in such a fashion that it can be adjusted to any cutting angle. A second bolt secures the fully adjustable template-holding bracket to the lathe bed. Full use of both cross feed and compound is permitted at all times.

Accurately ground  $\frac{1}{8}$  x 2-inch wide gage stock templates are recommended to guide the movement of the Pro-Tracer



slide. Template length is limited only by the length of the lathe. Preloaded ball bearings in the slide assembly prevent all play, backlash and tool lag.

Boring and ID contours can be turned by the same method as conventional OD turning, and a 90-degree step can be cut in the direction of the feed. Pro-Tracer can be used effectively for all types of OD turning, including tapers, and it will make an 0.031-inch minimum radius and will turn an unlimited maximum radius.

Turning 90 degree shoulders in the direction of the feed, or blending a shoulder with a radius is possible on either ID or OD turning.

Profile facing is accomplished by turning Pro-Tracer at right angles to the spindle. Internal or external threadings, straight or tapered, can be made; and because of the quick cutting tool retraction, the thread can be cut close to a shoulder without danger of breaking tools.

Pro-Tracer is manufactured by the Air Control Div. of Lehigh Foundries, Inc., 1500 Lehigh Drive, Easton, Pa.

T-7-1121



## Gages

The Taft-Peirce Mfg. Co., Woonsocket, R. I., announced an addition to its gage line, Electroized gages, which have a longer life due to the even film of hard, nonmagnetic alloy applied to all gaging surfaces during the electroizing process. This coating is only 0.000025 inch thick, but it imparts a tough surface much harder than tool steel, resulting in long, accurate gaging life before the gage reaches wear tolerance limits.

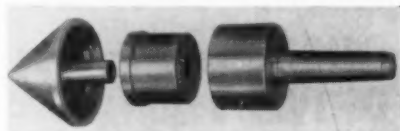
In addition to durability, the surfaces of Electroized gages are so smooth as to reduce friction to a minimum, and possess a high degree of resistance to corrosion. Being extremely tough, the gaging surface will not chip, peel, or spall under normal gaging conditions.

This electroizing process can be applied to Taft-Peirce standard or special gages, and to CompAIRator air gage members. **T-7-1131**

## Live Center

A live center incorporating the features of the Jergens pilot bearing bushing has been announced by J. G. Jergens Co., 11106 Avon Ave., Cleveland.

According to the manufacturer, old-style lathes can be made as efficient and productive as newer lathes. On a typical installation on a No. 4 Warner & Swasey with babbitt spindle bearings,



the depth of cut was increased 300 percent with cutting speed increased 55 percent.

The manufacturer further stated that this new production tool allows the use of carbide tools in older equipment and withstands heavy thrust loads while maintaining extreme precision.

The live center can be furnished in any type shank and nose. It is especially adaptable to metal-spinning lathes. According to the manufacturer, the Jergens live center is completely sealed against dirt and grit; requires no lubrication; is adjustable for bearing wear; wide range of interchangeable noses; rugged construction for heavy cuts with carbide tools; minimum overhang for rigidity; tapered roller bearings for smooth chatter-free operation; and is used on lathes, grinders, turret lathes, automatic lathes, hobbing machines.

**T-7-1132**

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION



Farquhar Hydraulic Press at the Weirton Steel Company straightens stopper rods. It has doubled production, required practically no maintenance.

## Farquhar Hydraulic Press at the Weirton Steel Co.

**"eliminates breakage of rods...increases production 100%"**

The Weirton Steel Co., Weirton, W. Va., formerly straightened stopper rods with a steam hammer. The operation was slow and resulted in a high percentage of breakage. Seeking a better method, Weirton officials bought a Farquhar Press to speed production. Not only has the press increased production 100%, but it has eliminated breakage of rods. In addition, Weirton reports that in the six years this press has been operating, "practically no maintenance has been necessary."

### Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in modern production! Farquhar Presses are

built for the job... assure faster production due to rapid advance and return of the ram... greater accuracy because of the extra guides on the moving platen... easy, smooth operation with finger-tip controls... longer life due to positive control of speed and pressure on the die... long, dependable service with minimum maintenance cost.

Farquhar engineers are ready to help solve whatever production problem you may have. Send for free catalog showing Farquhar Built-for-the-Job Presses in all sizes and capacities. Write to THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1519 Duke St., York, Pennsylvania.

**Farquhar**

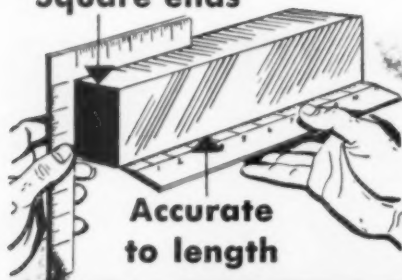
## HYDRAULIC PRESSES

for Bending • Forming • Forcing • Straightening • Assembling • Drawing  
Extruding • Jogging • Forging • and other Metalworking Operations

THE OLIVER CORPORATION, A. B. FARQUHAR Division

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-113

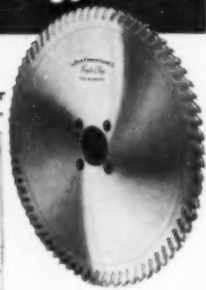
## Square ends



**Accurate  
to length**



Ask for our Circular  
Sawing Handbook.



Segmental - 11" through 108" dia.  
Solid - 8" through 20" dia.

Down with scrap! Up with usable production! Whatever the material or shape or size, Motch & Merryweather has a segmental or solid blade for the job. You get highest practical speeds, ends square and burrless, cut-off pieces meeting close tolerances. Resharpen repeatedly at low cost. Obtain Triple-Chip long life and economy.

**INVESTIGATE, TOO, THIS  
VALUABLE AID TO  
PRODUCTION**



## DISTINCT ADVANTAGES

For the most favorable results, time- and profit-wise, use Motch and Merryweather's superb coolant. Anti-weld averting pickup. Sharper tools and longer-lived. Oily, but not "greasy". Smokeless, odorless. A real aid to money-making production.

THE MOTCH & MERRYWEATHER MACHINERY CO.

715 PENTON BUILDING  
CLEVELAND 13, OHIO



REMEMBER - IT'S THE COST  
PER CUT THAT COUNTS!

Only  
M & M builds  
ALL 3:  
CIRCULAR SAW  
SAW BLADES  
BLADE GRINDERS

INDICATE A-7-114-1

## Roller Bearings

A line of cage type roller bearings for slow moving machinery is now in production by Inland Automatic, Inc., Dept. B108, 1108 Jackson St., Omaha 8, Neb.

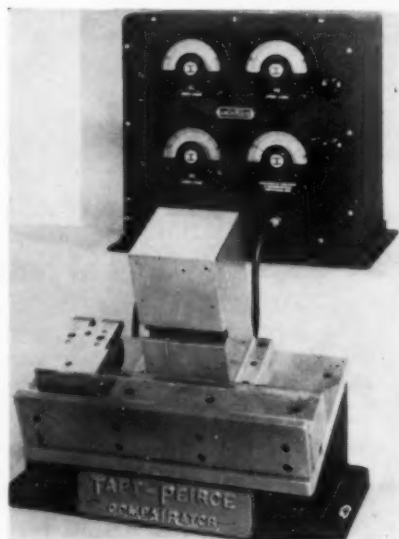
All components are statistically controlled for quality and precision in production, hydraulically assembled for uniform stress and individually inspected for ID and OD specifications.

T-7-1141

## Inspection Gage

The Taft-Peirce Mfg. Co., Woonsocket, R. I., has announced an air-operated gage to measure the dimensions over rolls of serrations in the root section of jet engine turbine blades.

The gaging fixture is made with tungsten carbide contacts, precision ground to a radius corresponding to the required roll dimension. These contacts are mounted on parallel reeds so that they are free to move in both a vertical



and a horizontal direction. This permits the measuring contacts to position themselves correctly, regardless of any permissible lead variations that may exist in the serrations.

Three air indicators, with dial graduations of 0.0001 inch, show dimensions as measured over rolls on each of the three serrated sections. In addition, the computing indicator has been incorporated as a fourth indicator to compute automatically the difference between the amounts that each of two dimensions varies from its mean value. The inspected part is rejected whenever the computing indicator shows this variation to be greater than plus or minus 0.001 inch. Furthermore, this two-point contact enables an inspector to explore any taper from end to end of the slots.

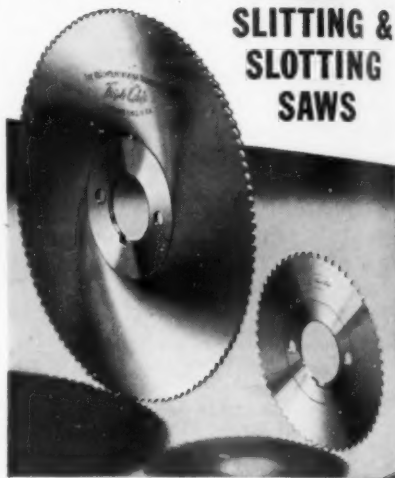
T-7-1142

**NO CLOGGING -  
NO BINDING -**

with **MOTCH &  
MERRYWEATHER**



**SLITTING &  
SLOTING  
SAWS**



The Motch & Merryweather Triple-Chip Method clears the way to faster results in milling operations. Alternately ground paired high and low blade teeth form curling, self-clearing chips which relieve stresses and minimize breakage. Saws produce more work and more accurate work and "live longer".

**DUAL  
DRIVE..**



**for More Power  
to Your Blades!**

Dual Drive is available on  
all M. & M. slitting saws.

Motch & Merryweather Dual Drive construction makes keyways unnecessary. Two pins drive the saw blade and eliminate stresses at the drive point. The Dual Drive adaptor is keyed to the arbor, thus permitting a wide interchangeability in saws.

THE MOTCH & MERRYWEATHER MACHINERY CO.

715 PENTON BUILDING  
CLEVELAND 13, OHIO



REMEMBER - IT'S THE COST  
PER CUT THAT COUNTS!

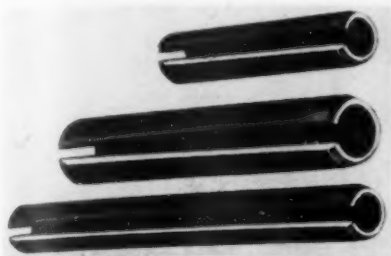
Only  
M & M builds  
ALL 3:  
CIRCULAR SAW  
SAW BLADES  
BLADE GRINDERS

INDICATE A-7-114-2

## Spring Pin

This fastener, called the Sel-Lok spring pin, replaces tapered, grooved and dowel pins in all kinds of assemblies. It is vibration proof, absorbs shock, is easy to insert and remove, eliminates expensive reamings operations.

The spring pin was seen first in this country in a head assembly on a captured German aircraft cannon in 1942.



Patents on it were issued in Germany in 1925. It was used on a Swiss loom in 1935.

The Sel-Lok spring pin, which is heat treated, is as strong as a solid cold-rolled steel pin of the same diameter. It is a stock item in standard and light-duty wall thicknesses, in diameters from one-sixteenth of an inch to half-inch and in a wide variety of lengths. Heavy-duty pins are a special.

Pins can be had in carbon steel and in corrosion-resistant steel and, as specials, in copper-based and aluminum-based alloys. Plating available includes zinc and cadmium.

For information, write Standard Pressed Steel Co., Jenkintown, Pa.

T-7-1151

## Cleaning Compound

The development of Powrite, a rust-inhibiting metal cleaning compound, has been announced by the Whitfield Chemical Co., Dept. 26-A, 14225 Schaefer Highway, Detroit 27.

Powrite, it is stated, is being marketed as a multipurpose cleaning agent for use in mechanical power washing equipment for removing oil, dirt, chips, and abrasives from all types of metal surfaces. Other uses include cleaning before phosphatizing; maintenance cleaning of paint; wetting out of dust and paint overspray; conditioning hard water to prevent scale or rust in mechanical washers, steam equipment, and grinders.

The compound may be applied in power washers, tanks, or spray booths at concentrations of  $\frac{1}{2}$  to 4 ounces per gallon of either hot or cold water. Rinsing after cleaning is not necessary, though with some applications it might be advantageous.

Dust-free, granular, and water soluble, Powrite is low foaming, preventing lime scale deposition.

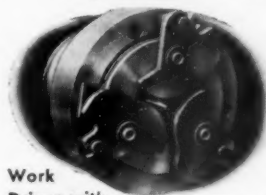
T-7-1152



Announcing

**+GF+  
Work Drivers**

**Revolutionary new time and energy saver  
replaces work dogs on centered lathe work  
— SAFER — FASTER —**



Work  
Driver with  
hood removed

Skinner is proud to announce its appointment as exclusive distributor for the George Fischer line of patented lathe work drivers. The +GF+ consists of 3 eccentric

jaws (6 on largest size) which have floating spring action to accommodate smooth or rough bars and forgings. A smooth protective hood covers all mechanism, and also acts as a manual opening and closing device for the jaws. A slight turn of this hood opens the jaws, and holds them open, until work is placed between centers—another turn releases the jaws to grip the work. Any increase in tool pressure and spindle speed automatically increases the holding power of the +GF+.

Jaws are easily reversed to accommodate direction of spindle rotation. Skinner carries a complete stock of +GF+ drivers and replacement parts.

Write Skinner or your nearest Skinner distributor for new illustrated folder giving complete details!



### NOTE WIDE RANGES!

Type 36 —  $\frac{1}{2}$ " to  $1\frac{7}{16}$ "  
Type 60 —  $\frac{5}{8}$ " to  $2\frac{3}{8}$ "  
Type 90 —  $\frac{5}{8}$ " to  $3\frac{5}{8}$ "  
Type 140 —  $\frac{7}{8}$ " to  $5\frac{5}{8}$ "  
Type 200 —  $4\frac{7}{8}$ " to  $8\frac{1}{16}$ "

**THE SKINNER CHUCK COMPANY**

212 Edgewood Ave., New Britain, Connecticut



Turn hood out of  
index position

Turn work piece  
against jaws



Turn work piece  
away from jaws

Turn hood until  
index snaps in

*Sold by leading distributors in every industrial area*  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-115





## Wire and Ribbon Metal FORMING MACHINES

Mounting production costs are driving firms out of the competitive picture. Too much scrap metal! Too many single operation machines! Too many operators! This whole picture can be changed to a highly profitable operation.

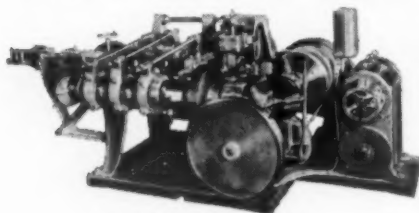
Install a NILSON combination press and 4-Slide forming machine. This machine takes wire or ribbon metal directly from the coil, straightens, feeds, pierces, blanks, swages, stamps, or coins, cuts off and forms . . . automatically in one quick precise operation. See the new picture? . . . Increased production! Minimum scrap metal! One machine for all operations! One operator!

For specific recommendations . . . send details of your operation.



NILSON has been specializing in Forming Equipment for over 50 years.

**THE A. H. NILSON MACHINE COMPANY**  
1520 RAILROAD AVENUE • BRIDGEPORT 3, CONN.  
CHICAGO • CLEVELAND • DETROIT •  
LOS ANGELES • HAMILTON, ONT., CANADA



INDICATE A-7-116-1

## Variable Speed Control

The Servospeed Div. of Electro-Devices, Inc., 4-6 Godwin Ave., Paterson, N. J., has introduced a line of electronic Servospeed systems for the speed control of series or universal motors. These systems are suited to the speed control of fractional and subfractional horsepower motors. A speed range of as much as 100 to 1 is achieved with motors having a base speed of 5000



rpm or higher. Three-wire motors may be controlled for one direction of rotation and four-wire motors may be operated in either direction selectively by use of a small reverse switch.

An electronic servo circuit provides smooth stepless speed control and employs a composite torque-speed feedback signal which offers many advantages over variable resistor or variable transformer speed control systems.

These units make available precise speed selection of wide speed range capability from remote points by fingertip selection of desired speed.

**T-7-1161**

## Gas-welding Hose

Hewitt-Robins, Inc., 666 Glenbrook Rd., Stamford, Conn., has announced an improved rubber hose for gas-welding apparatus which will withstand greater heat and flame than any previous hose and is also noteworthy for its light weight and ability to resist grit, sharp metal and oil to which welding hose is frequently exposed.

The improved hose has a neoprene synthetic rubber cover for flame resistance and a rayon reinforced carcass which, according to laboratory tests, offers greater strength and longer life than the conventional cotton reinforcement. The hose has double tubes, one for acetylene gas and the other for oxygen, and both are vulcanized together to form an integrated whole. This construction eliminates the twisting and knotting which often occurs when two separate hose lines are used.

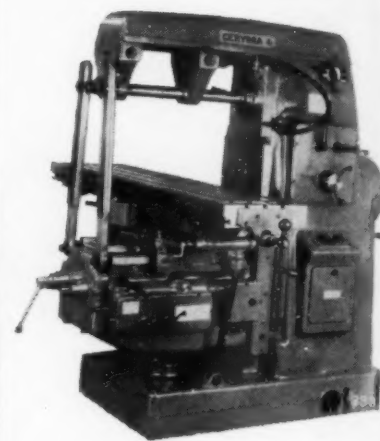
The hose has a working pressure of 200 pounds per square inch.

**T-7-1162**

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

# CERVINIA

## N. 4 UNIVERSAL MILLING MACHINE



### SPECIFICATIONS:

Morse Taper NST No. 50

Working Surface 67x15 3/4"

Power Feed Range:  
Longitudinal 47 1/4"  
Cross 13 1/4"  
Vertical 19"

24 Feeds:

Range 3/64"-18" per min.  
Rapid Traverse, 60" per minute

12 Spindle Speeds:

Range 16 to 1000 rpm  
Motor 8 HP

**DELIVERIES prompt**  
**SPARE PARTS available**  
**SERVICE nationwide**

Also available:

**LATHES**  
**SHAPING**  
**MACHINES**  
**MILLING**  
**MACHINES**  
**DRILLS**

For further information,  
write or call:

# MISAL

1 East 53 Street, New York 22, N. Y.  
ELdorado 5-7278

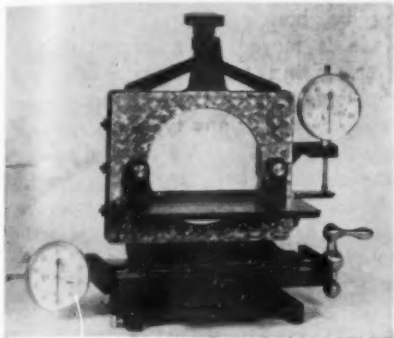
INDICATE A-7-116-2

The Tool Engineer

## Measuring Stage

A coordinate measuring stage for use on bench optical projectors has been announced by the Portman Instrument Co., Inc., 6 Manhasset Ave., Port Washington, N.Y.

This accessory to any optical compar-



ator will give 1-inch longitudinal travel, 1-inch vertical travel and 1-inch focusing travel. With addition of two 1-inch travel dial indicators measurements in coordinates can be made. The stage is also equipped with adjustable right angle platform which can be positioned in three different horizontal planes. This accessory can be easily adapted for use on any make of bench optical projectors.

**T-7-1171**

## Stainless Steel Coating

A line of products now available under the trade name Steelast has come out of the research work done on stainless steel coating. The formula for Steelast products is basically the same as that of stainless steel coating in that both use a vinyl plastic vehicle, the primary difference being that a change of pigment makes possible the manufacture of all colors including: black, white, gray, ivory, green, red, orange, and yellow.

Steelast produces the toughest type film of any ever tested in Steelcote Laboratories, impervious to moisture, resistant to most chemicals, and is odorless and nontoxic when dry.

The uses in which Steelast offers advantages over other coatings are protection and finishing of metal surfaces on original equipment, and maintenance of machinery, pipes, tanks, duct work and metal building materials, indoors and out. Steelast can be sprayed, brushed or dipped. It will withstand constant wet heat up to 180 F and constant dry heat up to 300 F. Dries to handle in 30-60 minutes after spraying; 2-3 hours for recoating. May be force dried in 10 minutes.

It can be applied to rusted or bare unrusted metal after surface has been treated, or over painted surfaces that show positive after pretest with primer. Manufactured by Steelcote Mfg. Co., St. Louis, Mo.

**T-7-1172**

# Backstand Belts increase production 40%!

**Three operations become two—  
using an Armour Backstand Belt**

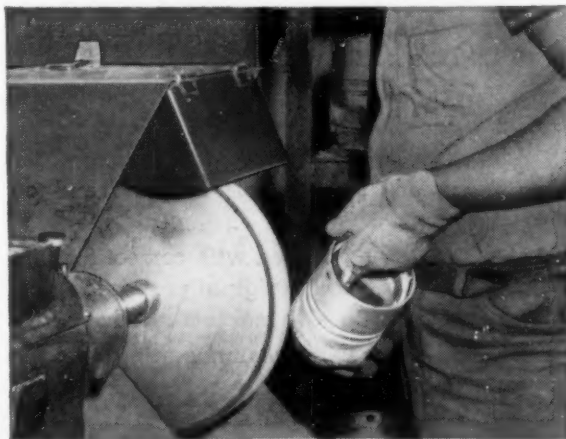
Sanding, polishing and finishing cast aluminum motor housings were three jobs for a well-known company\*, using a hard wheel and two set-up wheels. One Armour backstand belt combined the sanding and polishing operations, increasing production 40%! It outlasted 4 to 5 wheels, and gave a better finish!

Belts are only one of the many forms of

Armour coated abrasives. There are more than 30,000 different varieties in form, grit size, backing, etc., to meet your specific requirements. Your industrial distributor will tell you about this complete line. Call him today!

The booklet offered below will save you money in storing coated abrasives. Send for your free copy now.

**We recommend  
buying through  
your industrial  
distributor.**



\*Name of company available on request.

**MAIL THIS COUPON TODAY!**

Armour and Company  
North Benton Road, Alliance, Ohio  
Please send me the free booklet "How to Store  
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Name..... Title.....  
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City..... Zone..... State.....

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-117

# PIONEER TALES

No. 1 in a Series of  
cost-saving case histories



..... One of our clients

Had a swell new product .....



..... But, he couldn't figure out a way  
..... to make more than 100 a month ...  
without a big capital investment

Until he talked to  
Pioneer Engineering .....



Now, he makes 1200 a month,  
and his manufacturing costs  
are cut in half without  
adding any men or machines!

Everyone knows the best way to cut costs is through increased productivity. Contrary to the conception of increased production only through more men and machines, Pioneer does it a better way

Take the product mentioned above for example. We made a complete product manufacturing study of the unit. This included tolerance liberalization, interchangeability of parts, functional requirements of parts and overall economy of production.

Our study, coupled with correct functional design and the reprocessing and design of proper tools and gages cut manufacturing costs 50% and increased production 1200%.

And the product manufacturing study cost only \$1800!

Write today for  
Bulletin 162-A  
which describes our complete  
engineering services in detail.

19645 JOHN R STREET  
DETROIT 3, MICHIGAN



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-118

## Rod Cutter

A shear is one of the fastest, easiest, and most accurate means known for cutting steel rods of various kinds and sizes. Whitney Metal Tool Co., Rockford, Ill., now makes the No. 400 Rod Cutter for this purpose. It consists of a movable shear blade and fixed shearing die, both easily replaceable. The blade is moved by a geared 48-inch lever, giving tremendous power and producing a quick, smooth cut. Capacity of the tool is any type of mild steel rods from 1/8 to 3/4 inch diameter. The picture shows a popular on-the-job use for cutting steel reinforcing rods. The rod cutter may also be mounted on a bench in the shop, or carried to the work as it weighs only 42 lb including the operating handle.

T-7-1181

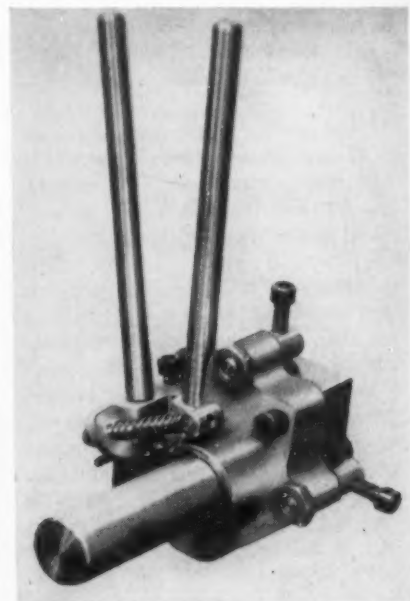
## Forming Tool

A forming tool that replaces the cross slide on forming operations has been developed by Mark C. Walker and Son Co., Orange, Calif.

Called the Walker roller forming tool, it is a hand-operated turret lathe attachment using any standard cutting tool to form hard steels or soft alloys. The work is supported firmly in place by rollers while the forming cut is made. Very close tolerances are easily held by inexperienced operators and rejects are almost eliminated.

The Walker roller forming tool gives a true, smooth high quality finish from stock sizes 3/16 to 2 inches in diameter. For additional information, write for circular 259.

T-7-1182



USE READER SERVICE CARD ON PAGE  
133 TO REQUEST ADDITIONAL TOOLS  
OF TODAY INFORMATION



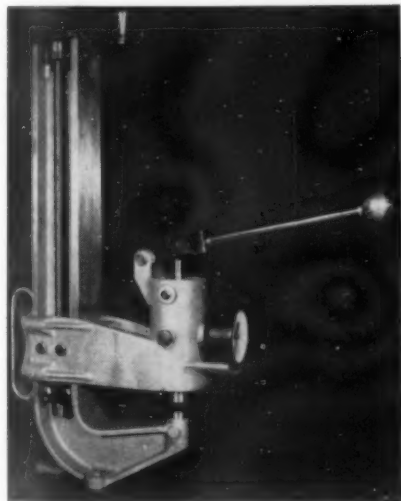
## Hydraulic Cylinder

A feature of the line of hydraulic cylinders announced by The S-P Mfg. Corp., Cleveland, is packing cartridge. The cartridge unit can be taken out by simply removing a snap ring. This usually can be done without even dismounting the cylinder. It is then an easy matter to replace the rod packing or rod wiper.

The cartridge is machined from high-leaded bronze alloy, according to the manufacturer, and provides double bearing surfaces of maximum length for the piston rod. This line of 2000-psi hydraulic cylinders includes 11 models in 11 bore sizes, built to JIC standards. Write for S-P Catalog No. 104 to The S-P Mfg. Corp., 12415 Euclid Ave., Cleveland 6. **T-7-1191**

## Hardness Tester

The Blosjo Porta-Brinell makes a positive hardness test. A special penetrator makes an impression at a controlled hydraulic force of 500 kg. The impression is read with a standard Brinell microscope and translated to Brinell hardness. Range of tester is 20 to 500 Brinell with maximum accuracy over the full capacity of the machine which is a 12-inch gap and a 4½-inch

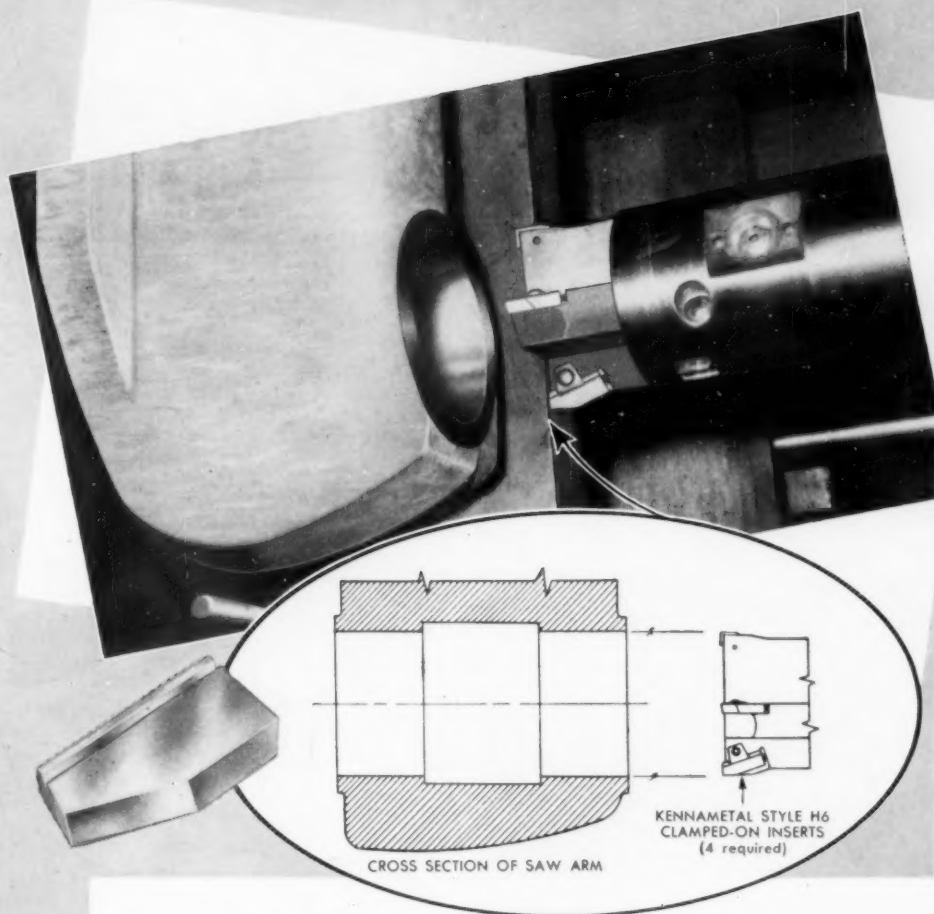


throat. Frame of tester is a rigid I-beam construction, yet the tester weighs only 17 pounds for easy portability. The tester works in any position and in portable testing, the work is clamped between the cylinder housing and anvil. The penetrator is then forced into the work from a retracted position within the cylinder body and again retracted before unclamping. This results in an unmarred impression. When bolted to a bench, a sturdy stationary tester is obtained.

Made by Blosjo Enterprises, 5310 Golden Valley Road, Minneapolis 22. **T-7-1192**

July, 1953

# How to make A BORING JOB LESS BORING



Time, cost, and trouble were minimized in boring a 4.7" diameter hole in cast iron saw arms by these tooling changes:

A standard tool Style C-12 was replaced by a special boring heading having four standard clamped-on Kennametal inserts Style H6, Grade K6. Speed was increased 20% and feed doubled. Boring time was reduced 60%.

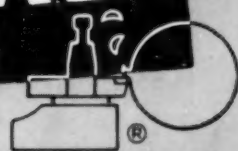
Before any tool sharpening was needed about 250 pieces had been bored. After six regrinds the inserts were advanced, this procedure being repeated until half of their length was utilized. Stubs were salvaged for tips on brazed tools.

Total life per set of inserts was 12,500 pieces — unit tool cost only 1/5¢. Obviously the job was less troublesome.

Although your machining problem is different, it also might admit improvement by use of Kennametal tooling. Our Tool Engineers will be glad to help. Kennametal Inc., Latrobe, Pa.

# KENNAMETAL

CEMENTED CARBIDE TOOLING  
THAT INCREASES PRODUCTIVITY

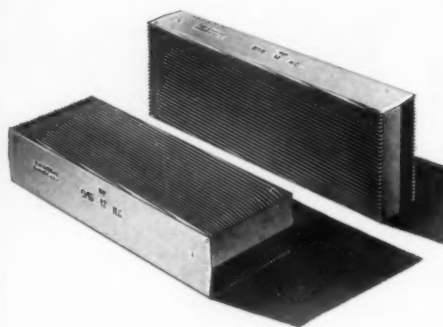
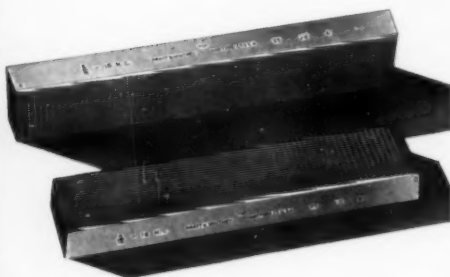


YOU CAN PRODUCE THREADS

# PRATT & WHITNEY

## Thread Rolling Dies

FOR CLEAN . . . SMOOTH . . . ACCURATE THREADS



### MORE PRODUCTION . . . CONSISTENT ACCURACY . . . LONGER RUNS

For maximum die life, long production runs without interruption, and consistently accurate, uniform bolts, screws, studs and similar threaded parts, choose P&W Thread Rolling Dies. Milled with ground thread hobs from special analysis high-alloy tool steel, these dies produce American National and Unified Threads in materials ranging from non-ferrous to tough alloy steels.

Take advantage of the comprehensive stocks of standard dies for Waterbury-Farrel, National Boltmaker and Manville machines that we maintain to meet your needs for prompt service. Special dies are made to your specifications.

For more complete information, ask the Pratt & Whitney Branch Office nearest you, or write direct to West Hartford.

## PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

*First Choice*  *for Accuracy*

BRANCH OFFICES AND STOCK  
CINCINNATI • CLEVELAND • DALLAS (The Stanco Co.) • DETROIT • LOS ANGELES  
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MACHINE TOOLS • CUTTING TOOLS • GAGES

\*OFFICE ONLY

### Tapping Attachment

An electrically controlled, automatic high production lead screw tapping attachment with a range of #0 to 3/4 inch, and which fits any drill press, has recently been introduced by the Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24.

Called the Lead-Matic tapper, the unit is designed to handle all types of production tapping—precision or otherwise. Simple electrical controls, located on the face of the unit, permit quick, easy selection of the proper tapping action, either job or cycle, best suited to the particular operation.

The Commander Lead-Matic tapper is provided with a precision ground lead



screw which pilots the tap into the work, producing the finest and most accurate threads possible. Perfect thread lead and concentricity are assured, as the lead screw provides both the concentricity and tapping lead, while the drill press merely provides rotation. Consequently, any inaccuracies of the drill press are not reflected in the performance of the tapper.

The tapper is a rugged, lightweight, self-contained production tool which incorporates the lead screw, lead nut and the entire tapping mechanism.

Employing the spring clutch drive mechanism of the Commander tapper which provides automatic reversal of the tap, no drill press motor reversal is required, making the entire tapping cycle faster and easier to accomplish.

On-the-job selection of a hand, foot, or fixture switch control permits maximum production in all types of tapping.

T-7-1201

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

All Tool Steel Looks The Same | Technical

## Who's Meeting - and Where

**June 28-July 2.** AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Semi-annual meeting, Hotel Statler, Los Angeles. Complete information available from society headquarters, 29 W. 39th St., New York 18.

**June 29-July 3.** AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. Society offices, 1916 Race St., Philadelphia, can provide full details.

**July 6-17.** MASSACHUSETTS INSTITUTE OF TECHNOLOGY. Summer Course in Product Design presented as part of a special summer program. Write to Director of Summer Session, Room 3-107, MIT, Cambridge 39, for particulars.

**July 20-24.** NATIONAL MACHINE TOOL BUILDERS' ASSN. and American Machine Tool Distributors' Assn. directing jointly the ninth annual Machine Tool Sales Conference. Purdue University, Lafayette, Ind. Enrollment limited to employees of members of the sponsoring organizations. Obtain details from NMTBA offices, 10525 Carnegie Ave., Cleveland.

**July 30-Aug. 1.** NATIONAL TOOL & DIE MANUFACTURERS ASSN. Summer meeting, Milwaukee. Contact association headquarters, 907 Public Square Bldg., Cleveland, for more information.

**National Plastics Exposition** announced in THE TOOL ENGINEER calendar last month is scheduled for June 7-10, 1954.

**The National Fluid Power Association** was organized recently following a meeting of 45 companies in the fluid power industry.

John C. Hanna, vice-president of Hanna Engineering Works, was elected chairman of the new association. Other officers elected included B. N. Ashton, president of Electrol Inc., first vice-chairman; John E. Erskine, vice-president of Racine Hydraulic & Machinery, Inc., second vice-chairman; E. G. Peterson, president, of Hannifin Corp., treasurer.

Headquarters office of the organization has been established at 1618 Orington Ave., Evanston, Ill.

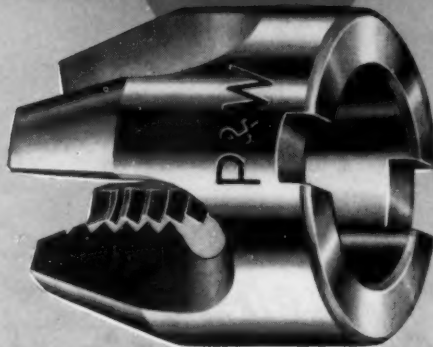
**The American Materials Handling Society**, at its recent annual meeting, elected the following officers for the coming year: George A. Smith of International Business Machines, president; Samuel Issacs of Sylvania Electric Products Co., vice-president; Douglas J. Gillespie of Northern Electric Co., secretary; and Albert Sanders of E. W. Bliss Co., treasurer.

# YOU CAN PRODUCE THREADS "TRUE AS A DIE"

WITH



## MONOCONE DIES



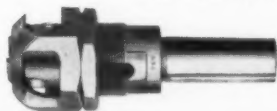
**DESIGNED FOR USE WITH ALL STANDARD HOLDERS USING  
A FLAT LOCATING SURFACE AND SQUARE KEYWAY DRIVE**

Having trouble cutting threads that will meet gage inspection? Try Pratt & Whitney Monocone Dies; get clean, uniform, accurate threads at lower cost. You can be sure that every Monocone Die is right, because they're all individually performance tested for cutting action, finish and accuracy of thread produced. Every Die is sent out with its test piece which has passed close gage inspection.

- PRECISION GROUND ON FACE . . . with the correct rake
- PRECISION GROUND CHAMFER . . . for clean, smooth cutting action.
- GROUND THREAD HOBS . . . used to insure thread accuracy
- CAREFULLY SELECTED STEELS . . . carbon or high speed, expertly heat treated for maximum toughness and wear life.

**AVAILABLE IMMEDIATELY FROM STOCK AT STANDARD PRICES**

Also Available — P&W MONOCONE DIE HOLDERS



REVERSING DIE HOLDER

RELEASING DIE HOLDER

*First Choice*



*for Accuracy*

Send For Complete Data



## PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

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Please send my free copy of Circular No. 546.

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MACHINE TOOLS • CUTTING TOOLS • GAGES



## All Tool Steel Looks The Same



*The Difference Shows Up Later!*

'RK-33—Air Hardening, Non-Deforming Cobalt, High-Carbon, High Chrome. For high production blanking, forming, drawing, trimming and shearing.

NEOR—The Original Oil Hardening, Non-Deforming High Carbon, High Chrome. Recognized as the ideal lamination die steel. Also suitable for other long run dies.

MINEOR—5% Chrome, Air Hardening, Non-Deforming. Has many desirable features of more expensive air hardening steels. Tough at high hardness.

OHT—Oil Hardening, Non-Deforming. Excellent machineability, minimum distortion, good resistance to wear. An economical steel for short run dies.

"MT6"—The Standard "M2 Type", High Speed Steel. Designed for a superior tool and at the same time save critical alloys.

And that difference often means money and time wasted. Judge Darwin tool steels solely on performance—how others have profited by its use—by thorough trial in your own plant.

Darwin tool steels, used as recommended by our engineers, outperforms and is a better steel for the money than you will buy elsewhere. Call or write today, we'll be glad to help solve any tool steel problems.

*Furnished in bar stock, billet, forging, sand casting. Drill rod, flat ground stock, tool bits. Bulletin on Request.*

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*highest grade tool steels*

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ZIV STEEL & WIRE CO., CHICAGO • DETROIT • ST. LOUIS • INDIANAPOLIS • TOLEDO • MILWAUKEE  
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-122

122

## Technical

## Shorts...

**O**PERATION OF ATOMIC piles and their related processes may be done by a "packaged" automatic control system according to Minneapolis-Honeywell Regulator Co. who report the successful design of the first such system.

Many electronic instruments—amplifiers, servo-amplifiers, recorders, controllers and servo-motors—are included in the completely integrated unit. These will automatically regulate the rate of power generation of the nuclear reactors at predetermined levels. This is accomplished by automatically regulating the reactor's control rods, which are analogous to an automobile throttle.

According to George M. Muschamp, vice-president of engineering for the Industrial Div. which designed the unit, the system will be especially valuable when linked to other automatic equipment to make feasible conversion of nuclear energy into electrical power by private industry. He pointed out that power generation requires absolute control on many conditions, such as temperatures, pressures and flows. With atomic energy as the primary source, there is the additional problem of instantaneously proportioning the nuclear reaction to these conditions. It is in this role that the researchers anticipate an important activity for the reactor control system to electronically coordinate these operating conditions.

Explaining the operation of the system, Mr. Muschamp said its initial function is to guarantee a "safe start-up" of the chain reaction. This chain reaction commences when the nucleus of a uranium atom is split under neutron bombardment. As it splits it releases more neutrons. These, in turn, split additional nuclei, releasing more neutrons and so on. To sustain this reaction a specified number of neutrons must be liberated per second.

As the control rods are removed to begin this chain reaction, a neutron-sensitive detector in the reactor itself sends out tiny pulses. These are picked up by an electronic amplifier—one pulse for each neutron detected by the chamber. Another electronic device counts the pulses and totals them on a register. The number of pulses occurring per second indicates the rate at which the reaction is increasing, and the control rod may be adjusted accordingly. As the reaction increases, another electronic instrument integrates these pulses, and translates them into voltage readings proportional to the

**The Tool Engineer**

number of pulses detected per second. Thus the operator has an automatic means of sensitively regulating the early stages of the chain reaction.

During the start-up process, and after the proper operating level has been reached, other electronic units in the system continue to monitor the reaction. If any abnormality is detected, they immediately shut down the reactor. Yet another series of amplifiers act to prevent the power level from going too high. Should this occur, they also will immediately shut down the reactor.

If the chain reaction were permitted to develop unchecked it could result in actually melting the reactor itself as well as releasing radioactive material that would contaminate the area. Therefore, without automatic safeguards, an atomic pile could not be operated practically.

Finally, a control series regulates the chain reaction continuously once it has been safely started and operation has levelled as desired. A specially developed instrument records the power level, signalling servo-amplifier units. These units, linked to special servo motor equipment, automatically adjust the control rods to regulate the nuclear reaction.

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**I**N THE INTEREST of business and industry improvement, a new publication has been developed by Wheeler Associates, Inc., a Cleveland consulting engineering firm. As an example of the type of information *Industry Ideas* contains, the current issue is mainly devoted to materials handling details. Details are presented on cost-cutting through materials handling, and an itemized check list facilitates evaluating present system or future improvement.

Copies may be obtained from the publishers, 15017 Detroit Ave., Cleveland 17.

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**A** NEWLY DEVELOPED shell mold release agent is said to have advantages in both performance and economy.

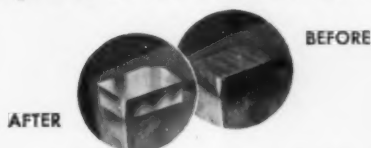
"Field tests have shown that it gives a rapid and clean release from pattern plates, and causes little or no build-up on molds," reported Mr. W. L. Carolla, Manager of the Industrial Section of Hollingshead. "This means that the product should find wide use in the kind of precision molding being done today," Mr. Carolla said. From an economic view he pointed to the results provided by the shell mold release. Comparable results he said have previously been obtained only from pro-

## An Important Trade Announcement

### A NEW, PRACTICAL METHOD FOR SHARPENING CUTTING TOOLS: FINISH GRIND AND DIAMOND LAP

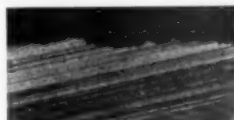
**CARBIDE...STELLITE...HIGH SPEED**

**Sharper Cutting Edges—Increased Tool Life  
Economical—Accurate—Easy to Use—Fast Cutting  
Adaptable to All Tool Grinders**

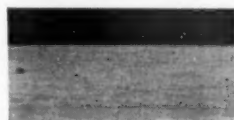


Savings from longer tool life and lower sharpening costs made possible by the new Pensco Dual Wheel finish grind and diamond lap are impressive. Less heat is generated by Pensco finished tools and finer machined surfaces are produced. The results obtained are superior to those with the usual diamond wheel.

Tests prove conclusively that the Pensco method increases tool life from 3 to 8 times that of normally finish ground edges.



Microphotograph of finish grind on 120 grit diamond wheel.

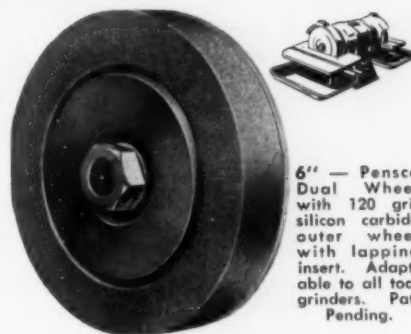


Microphotograph of Pensco Dual Wheel diamond lap finish.

After rough grinding, the tungsten carbide tool is finish ground dry on a 120 grit silicon carbide vitrified bond grinding wheel in the usual way. The tools are then diamond-lapped, in a

matter of seconds reducing the surface finish of the cutting edge from 15 to 20 Mu. R.M.S. after finish grind to 1 to 2 Mu. R.M.S. after diamond lapping.

The Pensco Dual Wheel, consisting of a 120 grit silicon carbide outer section and a phenolic resin diamond lap insert, is mounted on a tool grinder in the usual way. An auxiliary mount to accommodate the Pensco



6" — Pensco Dual Wheel with 120 grit silicon carbide outer wheel with lapping insert. Adaptable to all tool grinders. Pat. Pending.

Diamond Lap insert is provided for use where necessary. The insert is charged with Spectrum Diamond Lapping Compound (diamond paste) of the desired grit size. A U.S. Standard #30 (600 grit) is usually preferred. After finish grinding the tool is moved in to the lap insert for diamond lapping to produce the above mentioned results.

The Pensco Dual Wheel is supplied complete in a convenient kit with a 5 gram tube of Spectrum Diamond Lapping Compound, choice of any standard grit size (U.S. Bureau of Standards Specifications). Also included is a 4 oz. bottle of diamond lapping oil with atomizer applicator and wheel lap charging roller. The complete kit is priced at \$69.50. State grit size desired when ordering.



Pensco Dual Wheel Kit.



## PENSCO DUAL WHEEL

For Finish Grinding and Diamond Lapping  
Cutting Tools, Carbide—Stellite—High Speed

**PENN SCIENTIFIC PRODUCTS COMPANY**

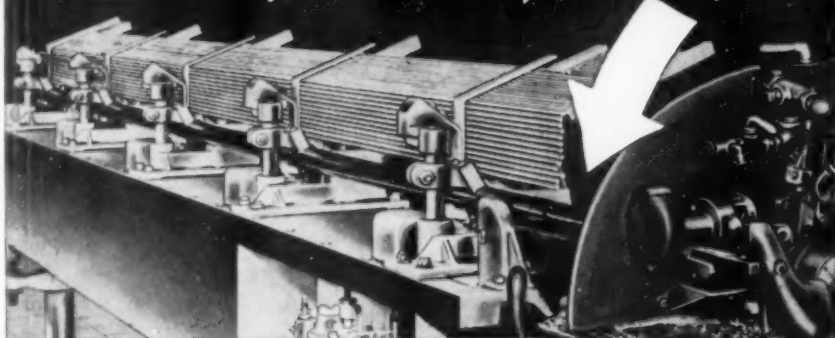
5941 ALMA STREET, PHILADELPHIA 24, PA.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-123

# LIPE

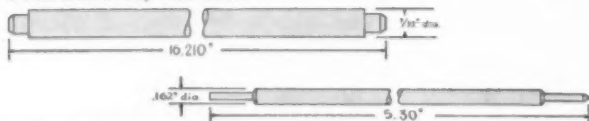
## Automatic Magazine Loading BAR FEED

*Averages  
Net Gain of 78%  
in running time!*



### Another Record

**THE JOB . . .** At L. C. Smith & Corona typewriter plant, Syracuse, N. Y., such operations as cut-off, chamfering, shaping ends, knurling were done on 14 different jobs, ranging in length from 5 1/4" to 16 1/4". A Model 00 B & S Screw Machine having a Lipe Automatic Magazine Loading Bar Feed attached, was used.



**THE RESULTS . . .** On running time alone, a net gain of 78% was averaged over the 14 separate jobs. And that's not all! A minimum of 30% was also gained in production because the screw machine does not "cut air" when it is left running unattended by the operator. Therefore, the overall result on these widely varied jobs is an average increase in total production of 108%.

## BIG Production Gains on a great variety of work Because . . .

- Stock is fed to screw machine all the time—not dependent on operator.
- Avoids multiple feed finger feed-outs.
- Feed-out pressure always behind stock.
- Model AML gives maximum output of machine—no "cutting air".
- Eliminates feed fingers.
- Saves in changeover set-up time.



Upon request we will be glad to send you a time chart showing the separate savings of the 14 jobs referred to in the case history above. Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers are glad to study your problem. No obligation.



*Li*pe - ROLLWAY CORPORATION

Syracuse 1, N. Y.

ducts costing three to four times as much.

Additional production features are said to be: no excessive build-up in crevices or irregular surfaces; more uniform coverage; clean molds—higher production; no preliminary break-in or pre-lube of patterns, and smoother and more accurate dimension of molds. Advantages of the mold release agent which lead to economy are listed as:

- a. More operating cycles per application,
- b. Water emulsion—no toxic or inflammable solvents,
- c. No objectionable odors,
- d. Noncorrosive to metals, and
- e. Stable in drum and diluted solutions.

The release agent is being marketed by the R. M. Hollingshead Corp., Camden, N. J.

★ ★ ★

**W**ITH THE RELEASE of its newest production, "Brass Means Business," Titan Metal Mfg. Co. of Bellefonte, Pa., brings the story of brass manufacturing to the screen, showing in dramatic fashion, the varied and intricate steps involved in the making of alloys and the manufacture of myriads of brass and bronze products.

To symbolize the rugged dependability of brass, the giant Titan—himself the company trademark—comes to life as narrator to stress the advantages of using brass.

Produced by Unifilms, Inc., from a script by Ovesti Granducci, this 16-mm sound and color film pictures the complex machinery and high level of skills required to produce precision-perfect brass and bronze. Made on the brass mill production lines, it shows mammoth extrusion presses geared for half a million pounds of hydraulic pressure, forcing metal through dies into fiery rods, skilled production workers presiding alertly over the glistening flow of parts, scenes of forging, annealing measuring, cleaning—all emphasizing the complexity of each process in making high-quality brass.

Since the ability to solve unique brass requirements for individual customers is one of the company's most important phases, the film explains how much research goes into developing the right alloy to fit the specific need. Pains-taking laboratory analysis, rigid and prolonged wear-testing, even design of machine tools for certain projects are all part of the story.

Inquiries concerning use of "Brass Means Business," which runs 27 minutes, should be made to: Film Department, Titan Metal Mfg. Co., Bellefonte, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-124



# Technical Digests . . .

**Engineering with Digital Computers,** by Allen Keller, Turbine Engineering Division, General Electric Co., Lynn, Mass.

Typical day-to-day engineering problems may be solved by a computer. As soon as managers and engineers, in general, acquire an appreciation of how problems may be organized for automatic computation, new applications will follow.

The large scale computer of the "giant brain" type stores all instruc-

balance is generally considered to be a rather involved operation. The mathematical problem is to calculate the steam and water flows at all points of energy transfer when the generator is delivering stated electrical output. The solution is a matter of trial and error. Even so, the problem can be systematized until it becomes a routine matter to solve on an automatic computer.

Although every heat balance diagram is different, all are built up from the same standard components. Fig. 1

side precise instructions as to the data which must be furnished the computer whenever that particular card is used.

By these means, the calculation of a heat balance becomes a routine matter.

1. Select the cards which delineate the diagram to be calculated.
2. Fill in the data called for on the reverse side of each card.
3. By keypunch, or its equivalent, convert the data on all cards into machine input.
4. Remove from the magnetic tape library the program for calculating a heat balance and place it in the tape reader of the computer.
5. Push the calculate button on the computer control console.

After this, complete heat balances for a number of different loads and exhaust pressures should be forthcoming at the rate of one every few seconds.

A modern high-speed computer is costly to operate, yet on large operations, it may easily be worth many times what it costs. In aircraft design work, for example, a computer may mean the difference between a successful and an unsuccessful plane.

Following are some possible engineering uses for digital computers and record-keeping machines:

1. Small, medium, and large repetitive engineering calculations.
2. The preparation of handbook data.
3. Data reduction (Correcting test data to standard conditions and the interpretation of results).
4. Inventory control (Nuts and bolts requirements).
5. Production control (What to manufacture, and when, to meet a frequently changing production schedule).
6. Piecework price setting.
7. Manufacturing cost estimates (For special products built largely from standard components, such as many industrial products).
8. Management reports (Reports the first day of each month for the preceding month).
9. Manufacturing operations scheduling (Consolidation of different lots in a job-shop type of manufacturing operation to minimize setup costs and increase output).
10. Automatic control of machine tool operations.
11. Scheduling the manpower and output for an operation (A drawing office for example).

Planning industrial production during national emergencies. (Remember CMP of World War II). This is a natural for a computer, both for a large manufacturer and for the government.

From a paper presented at the 1953 ASME Management Conference, Detroit, Mich.

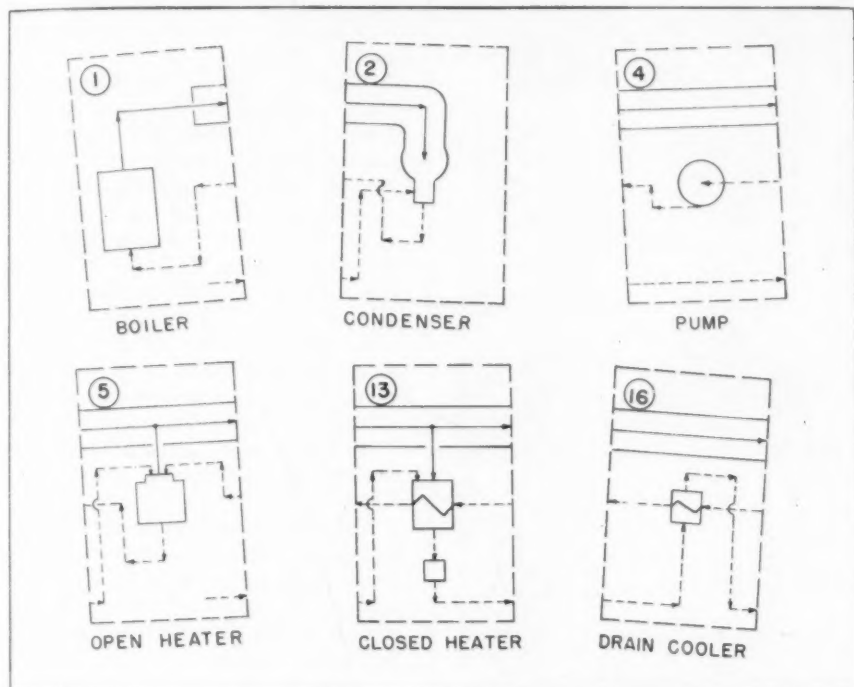


Fig. 1. Components of a feedwater heating system.

tions as well as data internally. This gives the computer a degree of freedom in that a large number of different calculation procedures may be stored and the computer instructed to select the applicable procedure for each specific calculation.

To engineers and members of management claims made for modern computers sound fantastic. Most people have little understanding as to how problems may be set up for solution on an automatic calculator. Without special input equipment, which is expensive and not generally available, digital computers cannot work with charts. Therefore, the reaction of the average engineer is "A digital computer cannot possibly solve my problem. My data are mostly empirical and mathematical expressions do not exist for the functional relationships involved."

The calculation of a turbine heat

shows some of these components drawn on individual, movable cards.

The numbers of the cards can be used to completely describe the heat diagram to an engineer and, by proper programming, can be used to cause an automatic calculator to make calculations for the proper feedwater heating components.

With about 50 different kinds of cards, substantially all desired diagrams can be delineated easily and quickly, including the fine points concerning packing drain piping, feed-pump efficiency, turbine state line shape, and so forth. This method of programming with cards might be called pictorial programming.

The input data required for the solution of a particular heat balance will depend on the complexity of the diagram. Each pictorial programming card can have printed on its reverse

**Pros and Cons of Shell Molded Castings,** by *Walter Sololosky, Plastics Division, Monsanto Chemical Co.*

Shell molding can be thought of as an inexpensive process for making high grade dry sand molds. Ordinary dry sand molds are usually used in foundry operations where a green sand mold is difficult to make, either because required dimensions cannot be held or moisture in the molding sand cannot be tolerated.

The two outstanding features about shell molding castings are the close dimensional control that can be main-

tained and the excellent and reproducible finish. Castings made in shell molds also show an almost complete lack of burned-on sand. These features result in many advantages over green sand molded castings. A large manufacturer with foundry, machine shop and assembly plant recently reported findings in favor of shell moldings as follows:

Up to 30 percent less metal is required per mold. Up to 70 percent less finish stock is required on castings. There is up to 18 percent less metal in castings, and up to about 45 percent less in sprue and gates. Cleaning and

other labor needs are reduced as much as 10 percent. With less metal to be removed machining labor is reduced as much as a quarter. A high degree of pattern detail is reproduced. Unskilled labor can be quickly taught to perform the casting operations. Less floor space is required due to smaller size of molds and pouring in a vertical position in many cases. Scrap losses caused by chilled edges and gas inclusions due to moisture are eliminated. Baked shells or assembled shell molds can be stored indefinitely with no deterioration from moisture absorption. The process is essentially cleaner than conventional green sand molding. In the absence of moisture in shell molds there is no appreciable "skin" effect, resulting in better machinability. A light skin cut may be made with no detrimental effects on tool life.

What are some of the drawbacks to shell molding? One reason for slow progress in its adoption is the inherent nature of many foundrymen to resist change. Lack of understanding of the process has also been a factor. Another is existing molding mechanization in foundries. High cost of patterns has also kept down the number of small foundries adopting the process.

In shell molding there are times when an inexpensive aluminum match plate type pattern is adequate while in other cases the best die type pattern of alloy iron is none too good. The pattern used should be the one that will best do the job.

The most promising of recent developments is a new technique for coating sands with resin. This increases efficiency of resin-sand mixes so that approximately 25 percent less resin can be used. Reducing material costs may prove to be the shot in the arm that shell molding needs to gain wider acceptance in the casting field.

*From panel discussion at the Market Development Conference sponsored by Malleable Founders Society and Illinois Institute of Technology, April 9-10, 1953.*

▼ ▼ ▼

**Titanium Alloy Development** by *M. Hansen and H. D. Kessler, Armour Research Foundation of Illinois*

The present commercial titanium-base alloys demonstrate the advantages to be gained by their substitution for other ferrous and nonferrous alloys in many applications. Strengths of up to 170,000-180,000 psi can be obtained in some of the current titanium-base alloys; however the higher strength levels are usually accompanied by low ductility. Problems in the forming and welding of the stronger alloys also tend to reduce their acceptability. Many of these problems will be solved as pro-



...but

## *Experience Cannot be Copied*

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate—without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be **SAFE**, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!



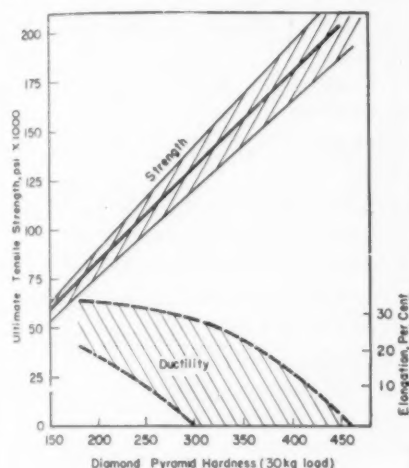
ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Ave. • Chicago 39, U. S. A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-126

duction techniques are developed.

The development of superior alloys requires an intelligent and systematic approach based on the following information: (1) knowledge of the equilibrium phase relationships of titanium with other metals, and (2) information regarding the kinetics of reactions in the solid state. Thanks to the farsighted research programs of the Air Forces and the Ordnance Department, much of this fundamental information is available and more is being obtained in the various research laboratories throughout the country.

Titanium metallurgy is in the ideal position of developing concurrently or



Tensile properties versus alloy content illustrating range of properties obtainable by heat treatment for two types of alloy systems.

even in advance of industrial practice. The important physical metallurgical information on phase diagrams and transformation kinetics is of considerable aid to alloy development and should help to bring about the development of optimum alloys for various applications in the shortest possible time. Use of this approach has resulted in the development of titanium-base alloys having excellent properties at temperatures up to 1020 F. Some of these show better creep rupture properties at this temperature than types 304 and 403 stainless steel.

From a paper presented at the SAE 1953 Annual Meeting, Detroit, Mich.

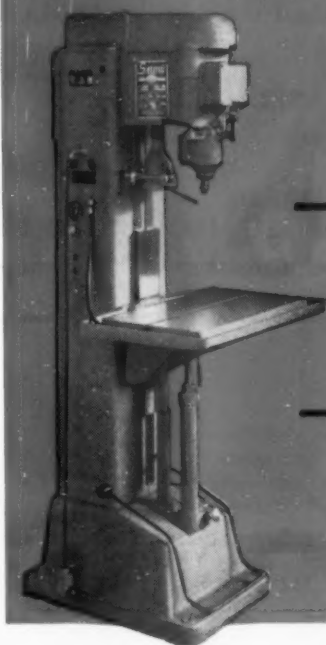
A MOTION PICTURE dealing with safety in fork-lift truck operation has been released by the Industrial Truck Div. of Clark Equipment Co. in answer to extensive requests from business users in the field. "Safety Saves," which runs 25 minutes with sound, includes driver training in addition to its treatment of problems and their solutions in industrial truck operation.

# Never Before

## SO MANY ADVANTAGES for HIGHEST PRODUCTION

# 4800 PER HOUR! 3800 PER HOUR! 2500 PER HOUR!

*For Top  
Production*



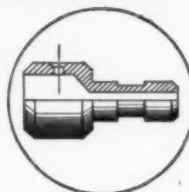
## SNOW

### FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

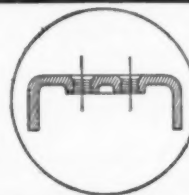
#### DRILLING

Crossdrill and C" T" Sink 1/16" Hole  
Material—Brass  
Production—4800 per hour  
Fixture—#15 Vertical index  
Equipment—#1-UD Drilling Machine



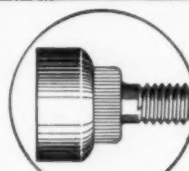
#### TAPPING

Tap Two #10-32 Holes  
Material—Steel stamping  
Production—3800 tapped holes per hour  
Fixture—#14 horizontal index  
Equipment—#1-UT tapping machine



#### THREADING

3/8"—24 Thread—1/2" Long  
Material—Die Cast Aluminum  
Production—2500 per hour  
Fixture—#10 Drum dial  
Equipment—#3-TR Threading machine



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MANUFACTURING COMPANY  
435 Eastern Ave., Bellwood, Illinois  
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Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

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Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

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T9	Some Basic Relations in Contour Forming	T21	Tooling Applications of Hard Facing
T10	Developments in Electrolytic Grinding	T22	Carbide Flame Plating
T11	Manufacturing Applications for Metal Stitching	C1	The Engineer & Progress
T12	Properties, Processes & Uses of Metal Bonding Adhesives	20SA1	Hi-Jet Lubrication (20th Semi-Annual Meeting Paper)

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# Field Notes . . .

*Discovery of a large deposit of nickel ore, which promises to become a major new source of that critical metal, has been announced by Freeport Sulphur Co. The deposit has been located in the vicinity of Moa Bay, about 500 miles east of Havana. At least 40,000,000 tons of nickel ore are believed to be there, according to explorers who recently completed extensive study of the area. Freeport plans to build a pilot plant for the recovery of the nickel and also of cobalt, another scarce and needed metal contained in the ore. The deposit at Moa Bay has been found to average about 1.35 percent nickel and about .14 percent cobalt.*

*Agreements have been concluded by the James H. Knapp Co. for the manufacturing, sales, installation and servicing of all products of Russ-Elektroofen K. G., of Cologne, Germany, in the United States, Mexico and Canada. This association will make available to the American industry, for the first time through U. S. sources, the Russ electric melting furnaces and hearth holding furnaces for aluminum, brass, copper, iron and other alloys. The announcement indicated that Knapp engineers have been studying Russ methods for some months, and production will start at once.*

*Precision Diamond Tool Co. marked its move to larger quarters with an openhouse recently so industrial leaders, customers and suppliers might inspect the plant's facilities and operation. The firm, which was organized in 1939, became known under its present name in 1941. Prior to founding, the company, Jan Taeyaerts he had managed a training school for diamond cutters in his native Belgium. Today, as a naturalized American, he heads one of the country's largest manufacturers of diamond grinding wheels and dressing tools.*

*Cooper Precision Products, a Los Angeles manufacturer of hex-head bolts for the aircraft industry, becomes a wholly owned subsidiary of Standard Pressed Steel Co. effective July 1. Reason given for the arrangement was to further diversify SPS products and give it manufacturing facilities in the heart of the Pacific Coast aircraft industry. According to plan, the companies will continue to operate independently, and each will retain its own sales organization. Harry S. Cooper will remain as president of the acquired company.*

*An independent laboratory, Cambridge Applied Research, Inc., has been established at 60 White St., Belmont, Mass. According to the statement, announcing the laboratory's organization, it offers industry the advantage of the services of scientists who are specialists in their fields working with the newest technical equipment in order to solve the problems faced today.*

*Manufacturers of Lucifer electric furnaces for heat treating The Gilbert S. Simonski Co., has announced its the corporate name change to Lucifer Furnaces, Inc. Clement Dinon is the new president of the corporation.*

Taking the "show" to the audience has proved a satisfactory switch for Westinghouse Electric Corp. which ingeniously outfitted a mobile display coach as a combination auditorium and exhibit hall. Thus the company is able to show to the customer, at his convenience, its common electrical devices such as line starters, control stations, motors and circuit breakers, and how they can be used to achieve successful automation.

The unit is taken to the customer's plant and runs consecutive 1½ hour programs for small groups of engineers. A movie and informal presentations of each display which are animated to simulate actual factory conditions, form the program.

The coach is scheduled to visit some 350 plants during a 14-month period.

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**Formation of a Canadian company** to provide service facilities has been announced by the Eutectic Welding Alloys Corp. The new company will be known as The Eutectic Welding Alloys Co. of Canada, Ltd. L. D. Richardson, divisional sales manager, will act as general Canadian sales supervisor in addition to his divisional duties. Michael Doody, who has represented the company in Eastern Canada, will supervise the organization in Ontario, Quebec and the Maritimes. District engineers have been named to all key industrial centers throughout the Dominion.

**Opening of a Mid-Atlantic Div. office** is announced by the Erickson Tool Co. Robert F. Lotz is manager of the office which has been established in the Philadelphia area at 32 Rittenhouse Place, Ardmore, Pa.

**Kurt Orban Co., Inc.** has appointed Miner Machine Co. of Denver, Colo., distributor of the company's line of German-made machine tools in Colorado, Wyoming, Utah and New Mexico.

**The recently created post of director** of manufacturing services of Borg-Warner Corp. has been filled by the appointment of Frank W. Pickard. He was previously general superintendent in charge of production at Chrysler Corp. Tank Engine Plant in New Orleans.

**Metal Carbides Corp.** has announced that it has recently opened two sales offices to facilitate distribution. Frank C. Thompson, Jr. is resident sales engineer for the office opened at 325 Bankers Trust Bldg., Indianapolis. A second office, at 743 N. 4th St., Milwaukee, was opened with Charles Roman as resident sales engineer.

**Transfer of headquarters and sales offices** of its Pioneer Pump Div. to 2750 Guardian Bldg., Detroit, and transfer of manufacturing operations to a new plant in Paris, Ky., has been announced by the Detroit Harvester Co.

**Michigan, Indiana and Illinois** will be the area for which Charles M. Norlin will be responsible as new regional manager appointed by All-State Welding Alloys Co., Inc. He will be the contact man for All-State's metallurgical resources and experimental laboratory which provide technical assistance for the solution of problems having to do with metal treatment, production and equipment.

**Bruce Herbert** has been advanced to direct factory representative in Minnesota and Wisconsin for Rollway Bearing Co., Inc. He has opened an office in the Administration Bldg., 647 W. Virginia St., Milwaukee.

**In connection with the increasing pressure on industry to provide more exact answers to complex engineering, research and production problems,** Tammen & Denison, Inc. has announced a substantial expansion of their electronics department. A number of electronics engineers have been added to the already more than 120 engineers which make up the company's staff specialists.

**Drawalloy Corp.** has announced that it now has started production of spooled wire for the welding industry automatic inert arc welding in its new and enlarged plant on Lincoln Highway West at York, Pa. The wire of 0.35 to 3/32 inch diameters in all stainless steel grades is manufactured to special chemical analyses required by the welding industry.

**At a recent annual shareholders' meeting,** the name of Jessop Steel Co., Ltd., was officially changed to Jessop Steel of Canada, Ltd.

**A factory at Warren, Ill.,** will be opened shortly to expand production of the Micro Div. of Minneapolis-Honeywell Regulator Co. The plant, a 10,000-square foot building obtained under lease arrangement, becomes the division's fourth manufacturing operation. Approximately 150 persons will be employed initially in the new operation.

**Reliance Electric & Engineering Co.** has established a new branch office in Baltimore, Md., at 13 W. 25th St.

The office, which is staffed by A. C. Schettler and W. C. Mitchell, is expected to broaden the availability of Reliance sales application and technical engineering service in the tri-state area of south central Pennsylvania, Maryland and Virginia.

**Sam E. Gewin** has been appointed district manager of the St. Louis office of The Bristol Co. For the past five years, he has been resident sales engineer in the Buffalo area.

**Two announcements concerning their branch offices** have been made lately by Thor Power Tool Co. Its Buffalo, N. Y. Office has been moved into a new building at 735 Military Rd., which will provide increased facilities for sales and will be equipped with a modern tool repair department.

In addition a new sales and service factory branch office is being opened early in July in Newark, N. J. This office, the 21st in Thor's domestic chain, is located at 1 Tichenor Lane and Parkhurst St.

**"Tomorrow is already here!"** according to an elaborate brochure, issued by Norton Co. in connection with the open-house presentation program conducted this spring to open the \$6,000,000 expansion of its Grinding Machine Div. The booklet features all phases of the company's operation from management through engineering, production planning and actual assembly and run-off, endeavoring to demonstrate the skill, knowledge and precision involved in all details.

The new plant which was revealed provides Norton with about 50 percent increased capacity for the production of its complete line of 45 different types of precision grinding and lapping machines. Straightline production simplifies the problem of quality control and expediting, resulting in more efficient methods and shortened delivery dates. Much materials handling formerly done by electric trucks now is done by floor operated cranes, and hand trucking between machines is reduced to a minimum.

**In connection with its centennial celebration this year,** Bausch & Lomb Optical Co. has published a brochure which gives the story of its founding and development, as well as picturing and describing its work in science and industry.

**Among announcements made recently by Firth Sterling Inc.** concerning its district sales areas was the announcement of appointment of Stuart A. Smith as Ohio District manager. Mr. Smith, who joined the company in 1949 as an industrial engineer is a member of ASTE's Cleveland chapter where he is a committee member of that chapter's carbide division.

At the same time, the opening of Firth Sterling's new Chicago district office and warehouse was made public. The new facility, located at 3415 North Ave., Melrose Park, provides considerably increased and improved stocking area. R. O. Valoon has been named district manager, replacing E. A. Carpenter who resigned to establish his own business.

Earlier, the company opened a branch office in Houston, Texas, in the Prudential Bldg. on Holcombe Blvd. to serve as headquarters of the new Southwestern District. Manager of this office is Robert B. Lewis.

**Modern Collet and Machine Co.,** has announced it will produce Tarex single spindle automatic turret lathes in this country. Two members of the Swiss organization, Jaques DuBois and John Boner will be associated with Modern Collet at least until the machines are in full-scale production.



The accelerated program of expansion and diversification which Westinghouse Air Brake Co. has instituted has resulted in the purchase of two companies and the bulk assets of a third in less than eight months. Latest acquisition is the earth-moving and related business of R. G. LeTourneau, Inc., for which Westinghouse paid \$26,300,000. As a result of these recent activities, the company has changed in less than three years from a supplier to virtually one industry (for the past 84 years it has manufactured equipment for railroads) to a manufacturer of instruments and equipments for scores of industries. The previous two purchases involved the Le Roe Co. in 1952, and the George E. Failing Co. in April of last year. Now, according to Edward O. Boshell, president and chairman of the company, the company is in the "consolidation and expansion phase" of its program. At present it is devoting its efforts to the complete integration of the companies it has acquired and to studying the possibilities of building up each of them.

An unusual service to management is being offered by Merchaneers Inc., which is aimed at eliminating the problem of costs in connection with tooling budgets and the risk involved in too-high tooling costs. The company proposes to take the tooling program budget of a given firm, and perform every function from the original blue print, through process engineering, tool designing, tool building, tryout and putting the tools into actual production in the plant. According to the president of Merchaneers, the packaged service will pin down the tooling program to one undivided responsibility at a fixed price; make available large tooling capacity for rush programs; and eliminate necessity of a large tool department overhead when no tooling program is in effect.

Production of the Micro Div. of Minneapolis-Honeywell Regulator Co. is expected to be considerably expanded with the opening of its new factory at Warren, Ill. The plant, containing 10,000 square feet of work space will become the division's fourth manufacturing operation. Initially, it will employ about 150 persons.

H. & B. American Machine Co. has announced the purchase of Karp Metal Products Co., Inc., manufacturers of specially fabricated sheet metal products. Karp now becomes the third recently purchased division of H. & B., earlier acquisitions being Midwest Tool and Engineering Co., and Octigan Forge. Present executive personnel at Karp will continue to operate the division.

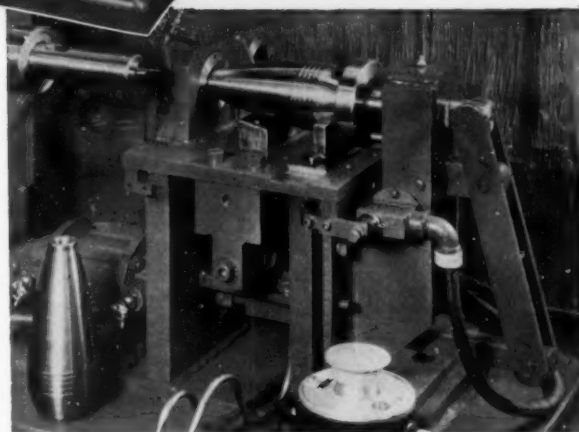
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Cleveland engineers have designed machines to meet the special requirements of scores of plants throughout the country. Because of their know-how—because of the precision tapping achieved at high speeds by Cleveland's famous lead screw feed and because several operations can be combined in one machine—you can be sure of getting more perfect pieces per hour with a Cleveland machine designed for you.

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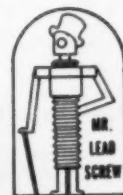
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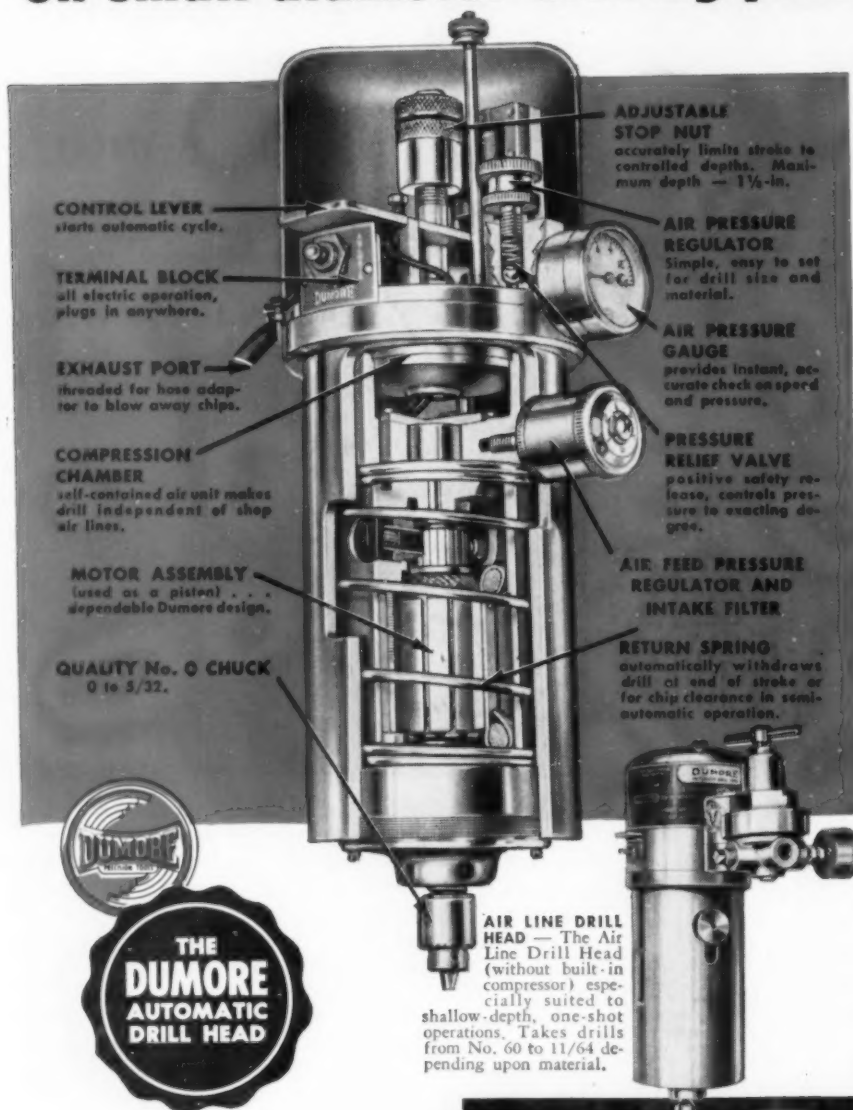
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The Dumore Company

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This year the Eclipse Counterbore Co., is celebrating its fortieth anniversary. From a start in the basement of the founder's home, the firm has steadily grown—first to a small shop, later to the loft of a downtown building, to a company owned building to the present continually growing plant. Yet, although the present product contains many refinements accumulated through the years, it does not differ greatly from the original counterbore which spurred formation of the company "to manufacture a new interchangeable type cutting tool."

Two Detroit tooling companies, Central States Engineering Corp., and Ace Tool & Die Co. have announced a joint service to design and build machinery and supporting tooling for cost-reducing, automatic manufacturing operations. The two companies have worked together closely for a number of years on numerous projects, with Central States designing equipment for manufacturers who, in turn, appointed Ace to build it.

According to the announcement, which was made jointly by the presidents of the firms, they will continue to work independently, simply recognizing the existant need of large mass-producing companies for placing design-and-build responsibilities for special machinery and supporting tooling with a single source. To that end "we are forming a separate company, the Ace-Central States Machine Tool Co., to undertake and coordinate the total job where needed from start to finish."

Paul H. Lahr has become European service engineer for the Monarch Tool Co. Mr. Lahr has acquired extensive knowledge of tooling in his 17 years of servicing all types of machine tools, principally in England, and for several months he has been studying latest developments in electrical, electronic and hydraulic accessories for Monarch lathes at the company's Sidney plant. His headquarters will be in London.

Production will probably begin about August 1 in the new plant now reaching completion for John Hassall, Inc., 102-year-old company makers of special fasteners and cold headed products. A one-story structure of steel, masonry and glass covers an area of about 88,000 square feet. Four monitor bays almost 23 feet wide and from 240 to 280 feet long permit natural lighting throughout the factory.

Aget-Detroit Co., 801 Main St., Ann Arbor, Mich., will now handle sales and distribution of Econaway abrasive belt splicer formerly available from Econaway Mfg. Co.

# THE TOOL ENGINEER'S

# Service Bureau

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	DESCRIPTION
A-7-148	Allegheny Ludlum Steel Corp. ....	<b>Die-Casting Dies</b> —A six-page folder "Hot-Work Steels," describes a chromium, molybden, vanadium hot die steel known as Potomac M, and covers other grades for other steel hot-work operations. (Page 148)
A-7-231	American Drill Bushing Co. ....	<b>Drill Bushings</b> —Catalog with large selection of standard sizes listed by ID, OD and length dimensions. (Page 231)
A-7-142	B. C. Ames Co. ....	<b>Dial Indicators</b> —Catalog No. 58 gives design details and application information on depth gages, amplifying comparators, micrometers, and small hole gages, each with a dial indicator. (Page 142)
A-7-137	F. E. Anderson Oil Co. ....	<b>Coolant</b> —An oil-free concentrate added to water makes this coolant. Case histories show how it removes heat fast, decreases the surface tension of water and protects the machines and products from rust. The coolant reduces odor in machines. (Page 137)
A-7-117	Armour and Co. ....	<b>Coated Abrasives</b> —Booklet "How to Store Coated Abrasives," offers suggestions and methods where large quantities are involved. (Page 117)
A-7-182	Baker Bros., Inc. ....	<b>Drilling Machines</b> —Information is provided on machines with wide ranges of speeds and feeds for single and multiple spindle drilling, reaming, boring, facing, chamfering, under-cutting and tapping operations. (Page 182)
A-7-194	Beaver Tool and Engineering Corp. ....	<b>Blade-Setting Fixtures</b> —Catalog No. 52 describes two types of fixtures—one with a solid spindle and adaptor bushings, the other with a tapered spindle—and other tools. (Page 194)
A-7-163	The Bellows Co. ....	<b>Hydraulic Control</b> —Bulletin 11C-600 and CL-50 offer suggestions on control of piston rod movements and other hydraulic and pneumatic combinations. (Page 163)
A-7-175	Bethlehem Steel Co. ....	<b>Tool Steel</b> —Booklet 265 gives details on Cr-Mo-W hot-work tool steel—easy to machine and heat-treat; resistant to heat checking—in manufacture of extrusion punches and forming dies. (Page 175)
A-7-186-3	Black Drill Co., Inc. ....	<b>Drills</b> —"Hardsteel" Operators Manual tells how to drill hardened steels without annealing. Case histories show how these drills can reduce costs. (Page 186)
A-7-218	Boston Gear Works ....	<b>Sprockets and Chains</b> —Supplement SC-2, 48 pages, offers buying information on all types of standard sprockets, Shold-A-Grip interchangeable tapered sprockets and bushings, roller chain and chain breaking tools. (Page 218)
A-7-168	Brush Electronics Co. ....	<b>Surface Roughness Gage</b> —Bulletin on "Brush Surfindicator" gives information on making surface-roughness measurements on the production line with portable instrument. (Page 167-168)
A-7-29	Bryant Chucking Grinder Co. ....	<b>Internal Grinding</b> —Booklet entitled "Alignment" gives complete details on internal grind finishing with special, general purpose and automatic machines. (Page 289)
A-7-150	Cadillac Stamp Co. ....	<b>Marking Devices</b> —Bulletin M-120 describes hand marking machine; air impact press; and hydraulic marking machine. Bulletin SE-120 describes miscellaneous items designed for all marking needs. (Page 150)
A-7-221	Carboloy, Department of General Electric Co. ..	<b>Carbide Dies</b> —Free Die Engineering Manual D-124 contains details on carbide applications and how they can be profitably applied to almost any blanking, forming, drawing or piercing die. (Page 221)
A-7-11	The Carborundum Co. ....	<b>Grinding Wheels</b> —Booklet entitled "New Simplified Basic Prices of Grinding Wheels" in 32 pages shows how prices can be determined (quantities and discounts) for a given wheel, by checking a single page of this book. (Page 10-11)
A-7-33	The Cincinnati Shaper Co. ....	<b>Shapers</b> —Catalog N-5 explains the extra strength, rigidity, and power in Cincinnati shapers, and the ability of the 50-psi lubrication system to develop and maintain oil films under heavy loads. (Page 32-33)
A-7-131	The Cleveland Tapping Machine Co. ....	<b>Tapping Machines</b> —Catalog No. TL-74 describes such components of specially designed tapping machines as high speed lead screws and combined operations. A separate "Production Tapping Guide" also available. (Page 131)
A-7-21	Crucible Steel Company of America ....	<b>Tool Steel</b> —New brochure describes reduction of drilling, boring, cutting-off and rough facing operations possible when using hollow tool steel. (Page 21)
A-7-198	Davis Boring Tool Division, Giddings & Lewis Machine Tool Co. ....	<b>Adjustable Blocks</b> —Bulletin No. 602 tells how Davis line boring tools with adjustable feature are easily adapted to counterboring, undercutting, grooving, facing and chamfering. (Page 198)
A-7-143	Delta Drill Unit Division, Rockwell Mfg. Co. ...	<b>Drill Units</b> —Catalog AD-723 offers suggestions on how to get better production at less cost with air powered hydraulic drill units in fully automatic multiple operation. (Page 143)
A-7-136-1	Detroit Stamping Co. ....	<b>Toggle Clamps</b> —De-Sta-Co. catalog describes more than 40 fixtures and portable models with holding pressures up to 4000 pounds. (Page 136)
A-7-193	Eastman Kodak Co. ....	<b>Optical Gaging</b> —New 12-page booklet gives full instructions on simplifying inspection and measurement problems in toolrooms or on production lines with contour projector. (Page 193)
A-7-228-1	M. A. Ford Mfg. Co. ....	<b>Grinding Burs</b> —Complete details plus operational data on over 300 Ford rotary tools offered in Catalog No. 207 with information on how regrinding service adds to tool life and reduces tool costs. (Page 228)
A-7-109	Fray Machine Tool Co. ....	<b>Milling Machines</b> —Bulletins 4 and 10 describe Fray "All-Angle" Head machines, and how they move precision work faster at less cost. (Page 109)
A-7-225	Hammfin Corp. ....	<b>Hydraulic Cylinders</b> —Bulletin 110 provides descriptive and technical information on line of standard and specially designed hydraulic cylinders, showing mounting styles and giving dimensions. (Page 225)
A-7-106-1	Hapman Conveyors, Inc. ....	<b>Conveyors</b> —Bulletin TE-753 offers information on tubular conveyor engineering features and mechanical details. (Page 106)
A-7-110	The Hiss-Wolf Machine Co. ....	<b>Drill Grinders</b> —Catalog 72 EG offers several suggestions on the care of drills and the use of drill grinders. (Page 110)

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# THE TOOL ENGINEER'S

# Service Bureau

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

## LITERATURE NUMBER

## COMPANY

## DESCRIPTION

A-7-112	Keller Tool Co.	<b>Air Tools</b> —Free 36-page booklet gives information and ideas on air-tool applications telling how to speed up production, reduce costs and simplify work. (Page 112)
A-7-34	Kling Brothers Engineering Works	<b>Friction Saws</b> —12-page bulletin gives complete story on friction sawing, including the principles of the process and some of its applications. (Page 34)
A-7-9	The Landis Machine Co.	<b>Taps</b> —Bulletin G-95 gives information on Landis L.L. Rotary taps; how cutting strains are reduced; thread accuracy and finish improved, and chaser life lengthened. (Page 8-9)
A-7-135-2	Levallee & Ide	<b>Reamers</b> —New reamer selector chart simplifies reamer selection and is accompanied by complete data on specifications and prices. (Page 135)
A-7-296	Lindberg Engineering Co., High Frequency Division	<b>Heating Units</b> —Induction heating units for production soldering, brazing, hardening, annealing, stress relieving, hot forming, forging or shrink fitting are explained in Bulletin 1440. (Page 208)
A-7-235	Magna Engineering Corp.	<b>Drill</b> —Description of a four-spindle drill that can tap and drill holes simultaneously without changing setup; even it at different angles. (Page 244-5)
A-7-174-4	W. F. Meyers Co.	<b>Bushings</b> —Catalog No. 13 offers hints on economy and increased production with carbide inserted bushings, and gives technical details and prices. (Page 174)
A-7-203	Micromatic Hone Corp.	<b>Honing</b> —"Cross Hatch" offers information on the Micromatic honing process of developing a surface that can withstand intense force. (Page 203)
A-7-26	Miller Motor Co.	<b>Hydraulic Cylinders</b> —Bulletins H-104 and A-105 give information on a complete line, including air cylinders 1½ to 20" bores, 200 psi operation; and LP and HP hydraulic cylinders from 250 to 3000 psi operation. (Page 26)
A-7-228-1	Morton Machine Works	<b>Clamps</b> —Illustrated catalog tells how standard fixture clamps and components can be modified to fit special applications. (Page 228)
A-7-214-2	New Hermes, Inc.	<b>Engraving</b> —Catalog 1M41 describes fast, easy method for engraving individual name plates, dials and panels. (Page 214)
A-7-104	Nilsson Gage Co., Inc.	<b>Dial Bore Gages</b> —Perfect visual control at machine as well as at inspection, described in Catalog D.E.M., which gives complete specifications. (Page 104)
A-7-227	The Ohio Crankshaft Co.	<b>Brazing</b> —"Typical Results of Tocco Induction Brazing and Soldering," compares old method (arc welding) and new method (induction brazing) showing cost-cutting results. (Page 227)
A-7-200	The Ohio Knife Co.	<b>Bedways</b> —Comprehensive bulletin gives details on hardened ways, gibs, wear strips, ball races, knives and shear blades. (Page 200)
A-7-151	Ortman-Miller Machine Co.	<b>Air &amp; Hydraulic Cylinders</b> —Free catalog shows cylinders and mounting brackets and gives specifications and sizes. (Page 151)
A-7-118	Pioneer Engineering & Mfg. Co.	<b>Engineering Services</b> —Bulletin 162-A describes complete engineering services in detail, telling how to cut costs through increased productivity. (Page 118)
A-7-219	Reynolds Metals Co.	<b>Aluminum</b> —Free brochure "Reynolds Aluminum Cast Plate and Bar for Machine Shops, Foundries and Pattern Shops" gives detailed information on attaining high dimensional stability, better performance and longer production life with aluminum tools, dies and fixtures. (Page 219)
A-7-215	Richard Bros. Div., Allied Products Corp.	<b>Punches</b> —Description of interchangeable and standardized punches and die buttons for quick insertion and removal in the press. (Page 215)
A-7-237-1	J. A. Richards Co.	<b>Benders</b> —Illustrated folder TE-5 gives information on production without special tooling, and saving on die costs and expensive presses. (Page 237)
A-7-183	The Rotor Tool Co.	<b>Grinders</b> —Bulletin No. 40 gives information on rotary sanding, wire brushing and grinding without expense for maintenance or time for repairs. (Page 183)
A-7-216-3	Severance Tool Industries, Inc.	<b>Carbide Mills</b> —Leaflet No. 645 gives complete information on special tooth patterns and cuts for all types of precision tool and die work. Bulletin CM offers prices and information on all-purpose Carbo-Mills. (Page 216)
A-7-179	The Springfield Machine Tool Co.	<b>Grinders</b> —Longer life, higher production and versatility are advantages explained in Catalog 183 with use of vertical grinders. (Page 179)
A-7-228-3	Stadol Mfg. Co.	<b>Lapping Oil</b> —Illustrated article prepared by leading tool analyst explains the advantages of wet grinding and how it cuts diamond wheel costs and increases tool life. (Page 228)
A-7-4	Standard Gage Co.	<b>Gages</b> —Catalog C offers information on dial snap gages, and how they affect economy and accuracy for internal or external measurements. (Page 4)
A-7-165	Sundstrand Machine Tool Co.	<b>Lathes</b> —Complete information given in bulletin 733 on simplicity of setup to make multiple tooling practical and profitable with 3 to 7 hp lathes. (Page 164-5)
A-7-157-3	Swanson Tool & Machine Products, Inc.	<b>Indexing Units</b> —Bulletin T4 tells how to save time, money and manpower in designing and building special, automatic machines for manufacturing operations. (Page 157)
A-7-156-1	Swartz Tool Products	<b>Holding Fixtures</b> —Catalog 941 describes all types of holding fixtures for machine shop production. (Page 156)
A-7-107	Vlier Engineering, Inc.	<b>Fixture Keys</b> —Catalog No. 53 explains how, with the use of Vlier tools, fixture and key rework is eliminated, production is faster and idle machine time decreases. (Page 107)
A-7-106	Waldes Kohinoor, Inc.	<b>Grooving Tools</b> —20-page Catalog No. gt-53 describes versatile tool designed for high speed, precision cutting of internal grooves in housings and bores. (Page 106)
A-7-106	Ward Leonard Electric Co.	<b>Chrome Plating</b> —Bulletin describes how undersize parts, worn tools and gages are restored to exact dimensions and finish with industrial plating unit. (Page 106)
A-7-23	Wesson Co.	<b>Tool Holder</b> —Bulletin No. 521 offers information on the advantages of Huski-Cut holders for heavy-duty and extra heavy-duty jobs. (Page 23)
A-7-136-2	Wilton Tool Mfg. Co.	<b>Vises</b> —Among advantages of these vises listed in new free catalog are: straight line pull for greater strength; fine malleable iron construction; sealed housing for protection of spindle from grime and grit. (Page 136)
A-7-135-1	Zagar Tool, Inc.	<b>Holding Fixtures</b> —Manual "E-7" gives detailed instructions on holding and indexing fixtures for milling, drilling, tapping and grinding. (Page 135)

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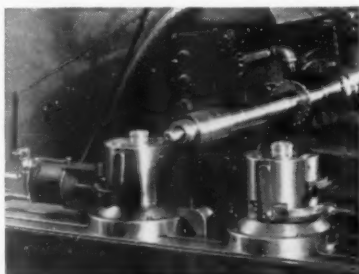
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Zagar "Air-O" (air-operated) fixture has all basic features above; still further speeds up operation. Control by hand, cam, chain or other cycling connection. All parts are interchangeable. Typical Zagar ruggedness and craftsmanship. 1" and 2" sizes.

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## Abstracts of Foreign Literature

By M. Kronenberg

### Supersonic Inspection of Weldments

Considerable progress has been made in recent years in the application of supersonic methods to testing and inspection of welded seams replacing to a certain extent, inspection by X-rays according to a paper by H. Kraechter in No. 5 of *Stahl & Eisen*, 1953.

The development of the so called "Angular Head," in addition to the "Quartz" head, of different types has made supersonic inspection of weldments possible. Due to the fact that weldments have, in general, a rough and irregular surface it is not feasible to employ the commonly known methods of supersonic inspection. However, when a high frequency sound wave is directed onto the surface at an angle between 35 and 80 degrees from the perpendicular to the surface, the wave enters the surface and can be directed so that it is reflected from the opposite surface through the weldment.

The signals which are converted in the usual manner into light beams in an oscillograph can be amplified by employing two angular heads instead of a single head. They are assembled at a desired distance from each other for best efficiency.

The author describes tests for inspection of welded high-pressure tubes carried out at the Max Planck Institute for Metal Research. The illustrations which are supplemented by microphotographs show examples of inclusions, internal cracks and many other defective weldments. It was found that a narrow peak on the screen of the oscillograph indicates a crack while a wider band or a gradual rise and fall of the amplitude is typical for porous welding. The method, it is claimed, is superior to X-raying for workpieces with a wall thickness exceeding  $\frac{3}{8}$  inch and up to 4 inches, while for thinner walls the X-ray method is better.

### Electronic Method for Measuring the Thickness of Metal Plating.

Beta-rays have been successfully applied to measuring thickness of coatings of chromium on aluminum, copper on carbon, rubber on iron, and also for measuring the thickness of aluminum and copper foils. The process is based on the reflection of beta-rays directed onto radioactive substances. The in-

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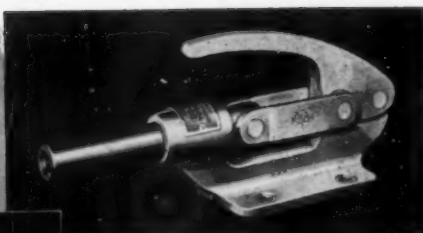
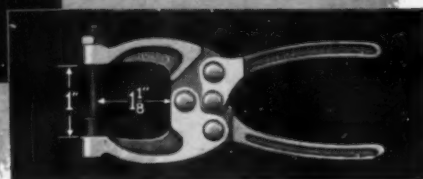
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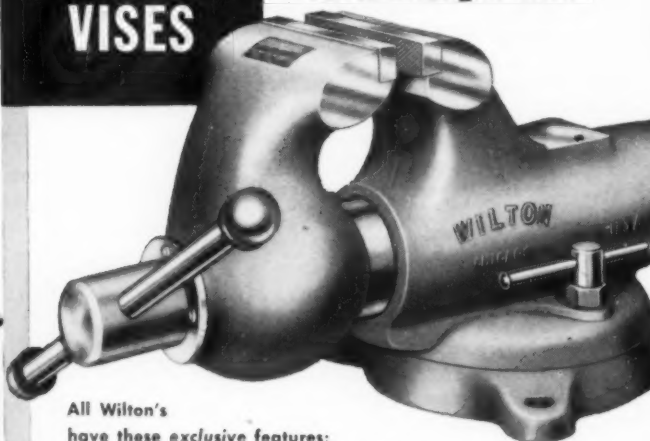
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tensity of the reflection depends on the atomic number of the material tested.

The author, R. Berthod, of the paper, which appeared in *Zeitschrift des Vereins Deutscher Ingenieure* of March 1, 1953 presented it for the first time in 1951 before a meeting of the Society for Testing of Metals in Germany but in the meantime has considerably improved the process. When a substance is subjected to high-velocity electrons (beta-rays), a portion is reflected, while the rest are converted into X-rays, which can be measured by an improved type of a Geiger-counter. After a thorough discussion of the physical principles involved, the author quotes numerous examples of practical applications which are, of course, also of interest to tool engineers.

He reports measuring the thickness of the chromium layer on plated cylinders made of aluminum. The highest accuracy obtained was  $\pm 3$  percent, the lowest about  $\pm 8$  percent covering a range of chromium plating from 0.00012 to 0.0036 inch. On the other hand it was also possible to determine the thickness of aluminum foil of 0.0004 inch thickness with an accuracy of  $\pm 1$  percent and that of a copper foil of same dimensions with an accuracy of  $\pm 0.5$  percent.

### Micro Induction Heat-Treating Process

High frequency heat treatment of tiny parts such as gears and shafts in watches has been made possible by the development of a process called micro induction heat treatment, according to a publication by W. Thorwart in *Zeitschrift des Vereins Deutscher Ingenieure* of April 15, 1953. The short time interval required for heat treatment of small articles, of about 0.01 to 0.001 seconds can now be considerably better controlled than before when it was customary to use a method of interrupting the current. The new process makes use of the discharge of condensers and eliminates switches and similar slow responding items.

The publication contains a great number of illustrations showing practical examples and microphotos. Among them is a gear of a wrist watch with 51 teeth and a pitch diameter of 0.36 inch. This gear had a hardness of 35 Rockwell C before and of 65 Rockwell C after heat treatment. A rack with 23 teeth each 0.072 inch wide and 0.016 inch high was heat treated without distortion of the required accuracy in one operation. A steel wire of 0.080-inch diameter can be heat treated so the core remains soft to prevent breaking of the wire. The hardness covers only about 0.003-inch depth. The equipment is small with a capacity between 50 and 1000 kva.



### Strain Gage Application in Tool Engineering

The economical extrusion of seamless tubes depends to a considerable extent on control of temperature, rigidity of the ram, its speed, design of the supporting rings and other such factors which could not be reliably determined due to lack of sufficient data.

K. Fink and C. Rohrbach have investigated these problems and used strain gages for measuring the forces involved in the extrusion of seamless tubings, as described in an article published in *Zeitschrift des Vereins Deutscher Ingenieure* of March 21, 1953. The strain gages were attached to the ram and protected from humidity and other adverse effects by a cover of paraffin and two semicircular steel cylinders carrying a chemical substance for drying the air in the vicinity of the gages. Forces have been determined in this way and the causes for irregular surfaces found, namely the variation in the resistance which the ram encounters.

### Hardness, Wear and Lubrication

According to a report in *Zeitschrift des Vereins Deutscher Ingenieure* of March 1, 1953 a paper on hardness, wear and lubrication was presented by E. Heidebrock before the Academy of Science at Leipzig in the Russian Zone of Germany. He recommended replacing heat treatment of gears by compressing the surface of the teeth obtaining in this way a hardness of the microstructure without the ill effects of heat treatment, namely heat distortion. He also discussed pitting of the surface of gears and does not consider them to be detrimental to the life of the gear, because of the fact that the indentations in the surface act as containers and distributors of lubrication oil. The author, who is considered an authority in this field of engineering has also published his findings in form of a book, volume 100 No. 4 of the publications of the Saxonian Academy of Science.

### Hobbing

H. Funke has developed a device which permits a more uniform wear of the teeth of gear cutters as described in *VDI Zeitschrift* of April 15, 1953. The hob is moved axially exactly by the distance of the teeth after finishing a workpiece. It is claimed that tool life increased 40 to 80 percent.

### Honing

German technical magazines have resumed the custom of publishing titles of Doctors' theses which they consider of interest to industry. Among them is a dissertation by G. Waninger dealing with kinematics and forces in fine honing operations.

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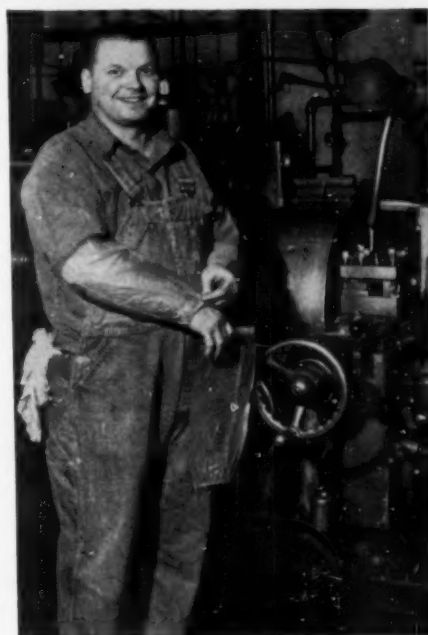
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### LUSOL proves non-irritating to machine operators' hands

The cleansing action of Lusol, together with its super-wetting properties, sometimes prompts questions about dermatitis. "How does such an efficient metal-working solution affect workers' hands?" It doesn't!

The case of the man shown above is typical of Lusol's performance in actual shop conditions. Sulfurized cutting oil, formerly employed, so irritated this man's forearms that he had to wear the plastic sleeves you see in the photograph. With Lusol in his machine, he has discarded the sleeves; has no skin trouble at all.

## users say\*

### case histories of Lusol at work

**A BEARING MAKER**—"Look at that fine finish! No smoke around the machine, and the bearing-hall comes off the broach so cool it can be gauged for accuracy immediately."

**A JOB SHOP**—"41 drills and 25 taps were required for producing 1,984 pieces in 50 hours. Changed to Lusol and produced more pieces in same period with 12 drills and 8 taps."

**A MOLDING MANUFACTURER**—"Lusol keeps the machines clean; a distinct advantage over the lubricant we formerly used. The men like Lusol because they can see the work clearly, right up to the time the metal enters the rolls."

**A MACHINE TOOL BUILDER**—"We remove 245 cubic inches of cast iron per hour in that surface grinder. Instead of 17 wheel dressings per chuck load formerly required, only 7 are needed now with Lusol. We're going 100% to Lusol."

\*User names furnished on request.



## FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 213-N, Portland, Conn.

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# North East West South IN INDUSTRY

George H. Sanborn, sales manager for Fellows Gear Shaper Co., was elected president of the American Gear Manufacturers Assn. for 1953-54 at the organization's recent annual meeting.

Other officers elected at the meeting included **Raymond B. Tripp**, executive vice-president of the Ohio Forge and Machine Corp., who became vice-president of AGMA; and **Fred R.**

**Eberhardt**, president of the Eberhardt-Denver Co., who was elected treasurer.

Three members elected to serve on the executive committee of AGMA were: **E. C. Denne**, who is consultant and manager of the gear department, United Engineering and Foundry Co.; **T. A. Jones**, president of W. A. Jones Foundry and Machine Co.; and **R. E. Smallwood**, project engineer, Industrial Div., Dominion Engineering Co.

After 33 years of service to Jones & Lamson Machine Co., **K. Hazen Woolson** has resigned as president of the company due to ill health. He will continue to serve as a director and has been appointed vice-chairman of the board. To succeed him as president, **Hardage L. Andrews**, former vice-president of the General Electric Co. has been appointed. Mr. Andrews retired from G-E in 1951 following a lengthy career which included varied experience and responsibilities covering engineering, manufacturing and sales.



H. L. Andrews



Jouett Shouse

The board of directors of **Anton Smit & Co.** elected **Jouett Shouse** to fill the position of chairman of the board, recently vacated due to the death of Leonard J. A. Smit. Mr. Shouse has been a member of the board since 1950 and also is a member of the boards of the General Aniline & Film Corp., and of the General Dyestuffs Corp. He also is a former member of Congress, and served as assistant Secretary of the Treasury under Woodrow Wilson.

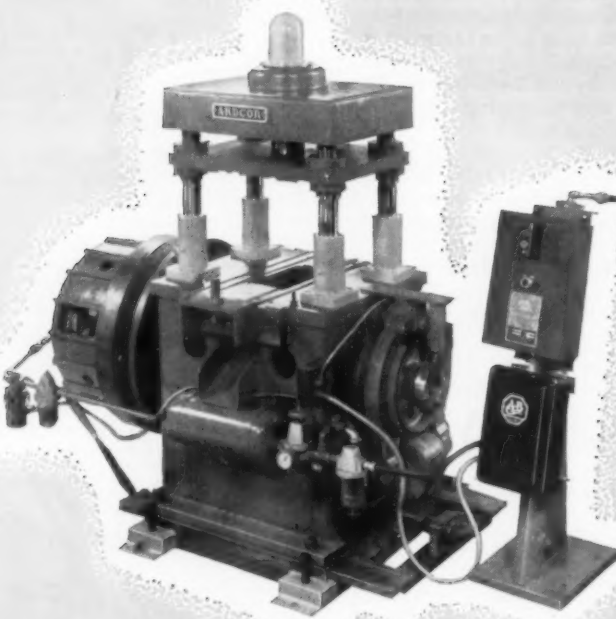
**Acme Steel Co.** has announced a change in its officers following a meeting of the board of directors. **Chester M. MacChesney**, formerly chairman of the board, was elected chairman of the executive committee, a newly created position.

**Carl J. Sharp**, who has been president since 1948, was elected chairman of the board. **Fred M. Gillies**, new president of Acme, joined the firm in 1950 as executive vice-president.

**Guy T. Avery**, who formerly was vice-president of production, was elected executive vice-president. **Bartlett Richards** becomes vice-president of production after having served as assistant to that position. The third man elected to a vice-presidency was **Thornton A. Rand**, formerly secretary and treasurer. He also retains the latter office. **Donald P. Mullaney**, formerly legal counsel for the company, was elected secretary.



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The election of **Thomas D. Chartledge** as vice-president has been announced by the **Union Carbide and Carbon Corp.** Mr. Chartledge has been president of Linde Air Products Co., a division of Union Carbide and Carbon for the past year, and also is a director and president of Dominion Oxygen Co., Ltd. (Canada).

**Clarence W. Fabel** has been appointed chief metallurgist of the **Atkins Saw Div.** of Borg-Warner Corp. Mr. Fabel comes to Atkins from Simonds Saw and Steel Co. where he was metallurgist and liaison engineer.



C. W. Fabel



T. S. Fuller

**T. S. Fuller** has been appointed consultant for the research and metallurgical departments of **Heppenstall Co.** Mr. Fuller recently retired after 42 years association with General Electric Co. He also was president of the American Society for Testing Materials in 1951-52.

Announcement made by **Nichols Wire & Aluminum Co.** named **M. J. Fey** to the position of executive engineer. New duties for Mr. Fey, who has been with Nichols for 30 years, will include supervision of development and design.



M. J. Fey



C. H. Reeme

According to an announcement from **Udylite Corp.**, **L. K. Lindahl** has relinquished duties as president of the company to devote full time as chairman of the board, and **Clyde H. Reeme** has assumed the presidency. Mr. Reeme, who first joined the firm as auditor in 1927, has served most recently as vice-president and treasurer.

Other shifts at Udylite included the appointment of **Lawrence V. Nagle** formerly vice-president and general sales manager, to the position of executive vice-president. In addition, **Arthur L. Barak**, who has been assistant treasurer since 1938, now becomes treasurer of the company.

According to recent announcement, **Gordon W. Smithson** has been promoted to the position of chief engineer of the **Potter & Johnston Co.** For the past 17 years, Mr. Smithson has been concerned with the electrical phase of the company's product; in his new position he will direct all product improvement, and engineering and research, both mechanical and electrical, on P & J machine tools.

**Firth Sterling Inc.** has announced the appointments of **Robert J. Steele** as general superintendent of the Carbide Div., and of **John D. Knox** as superintendent of the Powdered Metals Div. Until their recent promotions, Mr. Steele was superintendent of the Powdered Metals Div., and Mr. Knox was project engineer in the Research Dept.

Three new officers have been elected at **National Twist Drill & Tool Co.** **Alan R. Devine** is secretary; **John W. Davidson** is treasurer; and **Arthur L. Norton** is comptroller. All three are now members of the board of directors.

**John V. Eakin** has been named general manager of **Fawick Airflex Div.**, of Federal Fawick Corp. He formerly held the position of assistant general manager.

Three new vice-presidents have been named at **E. W. Bliss Co.** **Richard Y. Moss** is now vice-president and manager of the Canton, Ohio, Div.; **Robert Shannon** is vice-president and manager of the Hastings, Michigan, Div., and **Albert E. Whyman** is vice-president in charge of European operations.



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**Walter E. Gunnerson** was elected vice-president in charge of sales of **The Anderson Bros. Mfg. Co.** Associated with the company for 27 years, Mr. Gunnerson has served for the past 15 years as sales manager and chief engineer.

**Arthur S. Iberall** has been named to direct the recently formed research and development department of the Aircraft Div. of **Aro Equipment Corp.** In addition to his executive duties, Mr. Iberall will serve as a consultant to Aro customers needing technical aid.

**Jodson C. Travis** was elected president of **Handy & Harman** at the recent meeting of the board of directors. During the past year he served as vice-president and general manager, and prior to that he had been executive vice-president.

**Paul A. Metzger** has been appointed to the newly created position of materials manager at **Servil, Inc.** In this capacity, Mr. Metzger will supervise and coordinate material control, production control, shipping, expediting, materials warehousing and schedule planning.

**R. Paul Toeppen** has been made vice-president of the **James H. Knapp Co.**, designers and manufacturers of industrial furnaces. During the past 10 months, he has served the company as general manager.

Also announced from Knapp was the appointment of **John B. Florance** as chief engineer. Among the foremost engineers on the west coast, Mr. Florance formerly was with Knapp for a number of years.

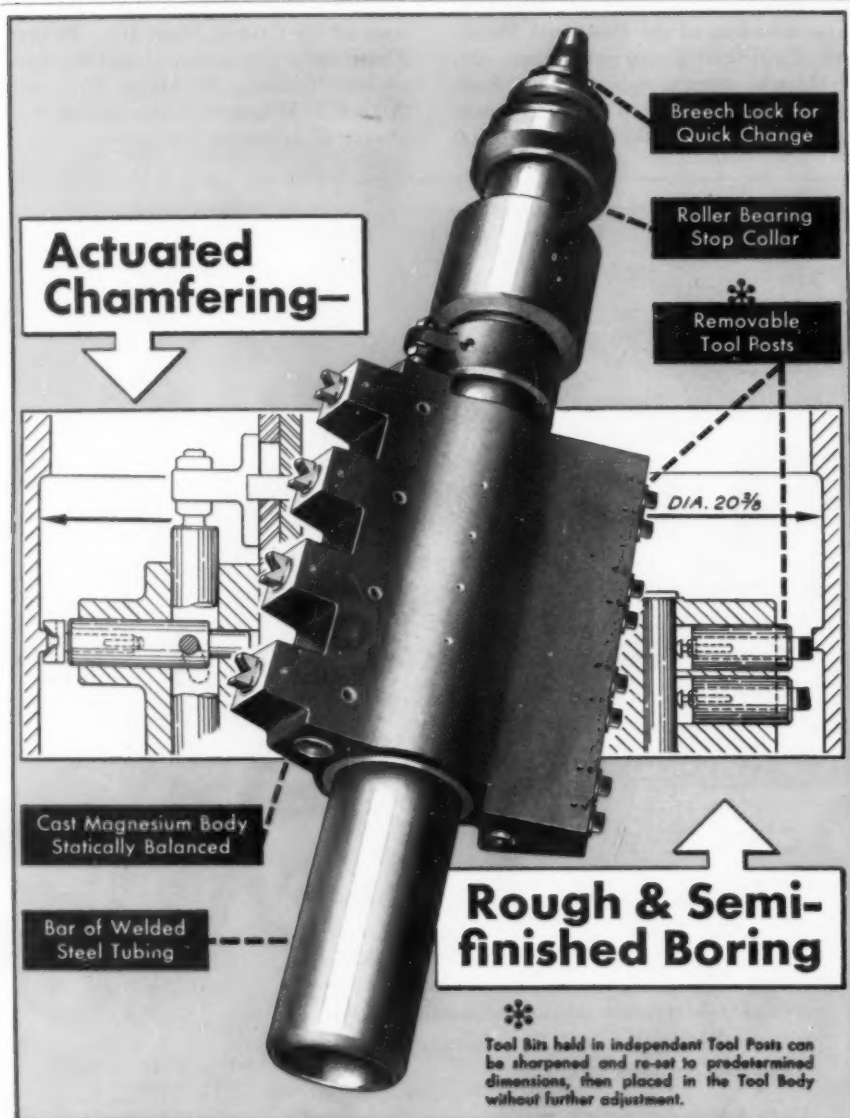
## OBITUARIES

**George C. Montague**, Norton Co.'s first grinding machine salesman, died recently. He was 86 years old. Prior to his retirement in October, 1936, he had been selling Norton items since 1898. His territory at first included the entire breadth of the country; later when sales areas narrowed, he was named New England district sales manager, a post he held until retirement.

**James W. McLaughlin**, vice-president of **Union Carbide and Carbon Corp.**, died suddenly at his home in New Rochelle, N. Y. He was 62 years of age. Mr. McLaughlin was also chairman of the board of Bakelite Co. and Bakelite Co. (Canada), Ltd.; vice-president, Carbide and Carbon Chemicals Co.; and vice-president and director, Carbide and Carbon Chemicals Co., Ltd.

**L. D. Rigdon**, consultant to the manufacturing vice-president of the **Westinghouse Electric Corp.**, died suddenly at his home at the age of 67. First joining Westinghouse in 1909, most of Mr. Rigdon's experience was in an executive capacity in connection with shop methods and equipment. During the last war, he not only managed manufacturing for the firm's Emergency Products Div., but was responsible for over-all liaison work between the ordnance plants and the Navy Department in executing operating contracts.

**Francis S. Denneen**, secretary-treasurer and co-founder of **The Ohio Crankshaft Co.**, died recently at the age of 73. His long and varied career included designing the electrification of the Great Northern Railway Co. through the Cascade tunnel and Cascade mountains, which at the time was an outstanding achievement. In 1914 he formed his own concern, The Denneen Motor Co., later to be consolidated with the Grant Motor Corp. In 1920 he organized, with William C. Dunn, the Ohio Crankshaft Co. He was to have received an Honorary degree in electrical engineering from Clarkson College of Technology at their graduation exercises this spring.



## TOOLING by GAIRING

Few of you will recognize the operation pictured here. Part of our defense effort, its exact nature cannot be divulged • All of you, however, will agree that the engineering and manufacturing skill to make tools of such apparent complexity and size — and to make them successfully — should put GAIRING into first place for consideration whenever you require special tooling of any description • May we ask our nearest representative to call?

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# From Our Reader's Viewpoint

## The Cost of Obsolescence

To the Editor:

It is frustrating, if not infuriating, for machine tool manufacturers like myself to periodically run across the statement that American made tools were not available. This appeared in the very excellent article in your May issue entitled, "Jet Engine Parts Produced in Record Time." Trampling on the pride of my industry, it reads: "Instead it was necessary to adapt many tools supplied by the USAF from war surplus depots, purchase rebuilt machine tools and buy many foreign machines. The company turned to foreign markets because American made tools were not available for immediate delivery."

I do not dispute the statement. Unfortunately it is true. But it seems unfair to leave that statement as is without asking "Why Not?" and provide an answer.

In recent years this situation has developed twice, once at the outset of World War II and more recently at the time of the Korean crisis. Was the machine tool industry derelict in its obligations to the country? Or had the government itself travelled the road to economic suicide by tying up the industry with restrictive laws and regulations?

For one thing, the machine tool industry has long been regarded as a business of "feast or famine." In so-called "normal times" industry struggles along with inefficient, outmoded tooling. Then comes a national crisis and industry is required to step up its production overnight. Old and worn machines are inadequate to handle the job. So what happens? The machine tool industry is deluged with urgent orders. Because it has been forced to retrench, it has neither the immediate manpower nor the facilities to pull machine tools out of hats, like rabbits.

What is the cause of this situation? It can be boiled down to one unfair and restrictive regulation of the Treasury Department known as TD-4422. Briefly, TD-4422 blindly assumes that a machine tool is useful and profitable as long as it is operated. All industry knows that the life of a machine tool depends upon many factors, the most obvious of which are: "How much is the tool used during its write-off period; what kind of jobs does it perform; is it properly serviced; and at precisely what point does it become obsolete and inefficient in terms of newer, improved tools?"

The direct result of TD-4422 is that industry uses its machine tools far beyond their normal lifetime of efficient usefulness. This is particularly true of small and medium-sized companies who must write off the old before they can afford to buy the new.

The machine tool industry is caught in this vicious feast or famine circle. Time, money and manpower are being wasted in the attempt to use machine tools to their last dying gasp.

In the summer of 1950 the machine tool industry was just recovering from its private depression in the midst of plenty. Why? Because war purchased surplus was being exhumed and forced to give their all for the Treasury Department. This was in the face of an admitted manpower shortage! Then along came Korea and the frantic struggle for more and better machine tools. After the present crisis is resolved, back will go the machine tool industry to the doldrums until the next dictator shouts "boo!"

What is the solution? It's simple. Get a realistic "write-off" regulation for machine tools. Let the individual company decide when obsolescence sets in. After all, it is the only one in a position to know.

J. A. BRADNER

Senior Member ASTE

Cleveland Chapter

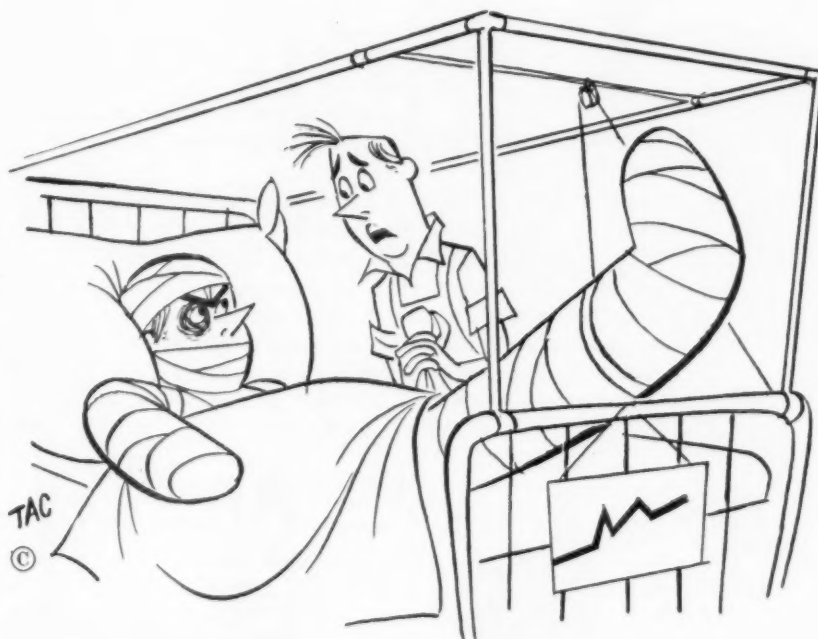
To the Editor:

Recently we sent an American made milling machine to Thailand. Native boys in this far eastern country are learning to operate this machine as part of their academic training. This is concrete proof that American industrial "know how" is appreciated in all parts of the world.

DANIEL F. GANEY, JR.

Ganey Machinery Co.

Buffalo, New York

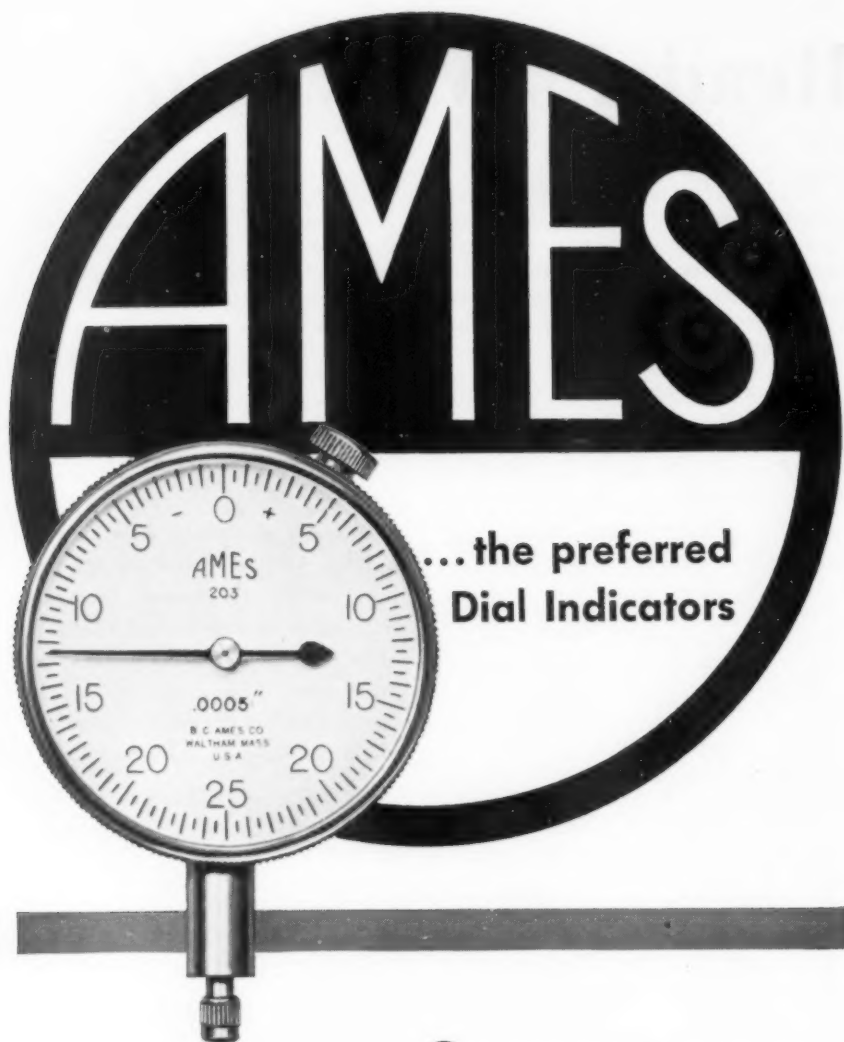


"Sorry I did it, Sam, but when you told me you forgot to re-order my OILDIE tool steel I guess I just lost my head."

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Producers of fine tool steels—High Speed Steels  
Die Steels—Hot Work and Shock Resisting Steels  
Carbon Tool Steels.





One of America's largest and most famous mass-producers recently chose Ames as preferred source of supply for indicator gauges.

The reasons behind this decision are the very reasons why you should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive, low in friction, yet are rugged and tough*—give more on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.



Ames  
Dial Depth Gauge  
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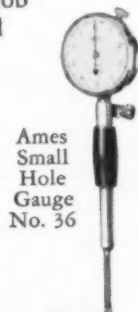


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## Good Reading

A GUIDE TO SIGNIFICANT  
BOOKS AND PAMPHLETS  
OF INTEREST TO TOOL  
ENGINEERS

**STRENGTH OF MATERIALS** by John W. Breneman. Published as one of the Pennsylvania State College Industrial Series by McGraw-Hill Book Co., 330 West 42nd St., N. Y. 36. Second Edition, 140 pp.

Parts of the material in this second edition have been rewritten to include new information and to clarify other sections. The book originally was written to meet the needs of the field of industrial training providing an adequately simplified discussion of the principles involved in strength of materials.

Problems included have been solved without the omission of any step, which adds to their value for study purposes. The problems have been taken from the practical fields of engineering and design and incorporate the fundamental principles of both mechanics and strength of materials. Mathematics above the level of trigonometry have been avoided in presenting the theory and practice involved. The subjects include tension and compression, riveted joints, welded connections, beam design and deflection, and steel and timber column design.

**INDUSTRIAL BRAZING** by H. R. Brooker and E. V. Beatson. Published by Iliffe and Sons, Ltd., London. 344 pp; price, \$7.50 from the British Book Centre, New York.

This is a full length study of brazing as a process for metal fabrication. It covers in detail such brazing methods as torch, furnace, high frequency induction, resistance, salt bath, and dip. The special considerations necessary in work on aluminum, stainless steels, beryllium copper, cemented carbides and vacuum tube construction are dealt with separately. A general introduction to the processes and equipment employed is followed by a review of brazing materials and a summation of the known factors governing joint design. A final chapter discusses problems of selecting the most appropriate process for brazing various types of work and makes some suggestions on methods of inspection and testing.

The book is illustrated with over 200 photographs and diagrams. Reference material is provided in the text as well as 32 tables.



**ENGINEERING DRAWING** by Thomas E. French and Charles J. Vierck. Eighth edition. Published by the McGraw-Hill Book Co., 330 West 42nd Street, New York 36. Price, \$8; 715 pp.

This volume has been a standard in the field since its first publication in 1911. In this new edition the book has been revised to follow the latest standards and to incorporate the modern methods and practices of engineering drawing. Almost every chapter has been rewritten to make the book easier to read and understand.

Chapters have been rearranged in four basic divisions for quicker reference. First, the fundamentals of shape description are presented, including pictorial sketching, perspective, intersections, and developments. Following are the chapters on size description, with the relationship between the drawings and the shop given, as well as advanced material on precision and limit dimensioning. Basic machine elements are discussed next: screw threads, keys, fasteners, rivets, springs, gears and cams, pipe, etc. In the last section are grouped related specialties such as architectural, structural map and topographic drawing.

**MECHANICS OF MATERIALS** by Seibert Fairman and Chester S. Cutshall. Published by John Wiley & Sons, 440 Fourth Avenue, N. Y. 16. Price, \$5.75; 420 pp.

The authors attempt in this book to make the subject of mechanics of materials meaningful by showing how to apply the theory of practical situations. A sound understanding of the elements of the subject is provided along with training in the use of the basic principles.

Numerous examples are completely solved to aid the reader. The explanation and illustration of the application of the area-moment methods in connection with both statically determinate and statically indeterminate beams is exceptionally thorough. The treatment of columns is designed to give a better understanding of the basic theory and its connection with the development of the empirical formulas used in practical design.

A large selection of problems for solving numbers more than 700. Some are grouped at the ends of specific articles on which they are based while the others are included at the chapter ends and are of a more general nature.

Certain advanced topics relating to special fields and applications were.



## Ryan Aeronautical Precision-Drills JET EXHAUST CONES

# 4½ Times Faster WITH 4 DELTA Air Powered Hydraulic DRILL UNITS

Four DELTA Drill Units at Ryan Aeronautical Company drill 160 precision holes . . . in forty minutes . . . through flanges of exhaust cones for jet engines . . . AND they do it to tolerances of —.001. With conventional machines, the job required three hours. The entire process is automatic. The operator simply presses a button . . . simultaneously actuating four drill units. They rapid-traverse to the work . . . drill at uniform feed through the tough stainless, then automatically rapid-retract without operator supervision.

Mr. Floyd A. Cox, Superintendent at Ryan, states: "Delta drill units are well designed to accomplish this job, and have proven their effectiveness in the work we are doing with them. The objective in drilling these stainless steel products is to bite into the work with consistent speed and rotation, and to maintain constantly homogeneous chip removal. These Delta drill units are driven by electric motors which provide steady, uniform rpm, and the air pressure actuating mechanism which operates the integral hydraulic feed insures absolutely even penetration."

## This Delta Air-Hydraulic Drill Unit Can CUT COSTS For You!

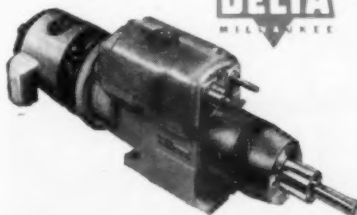
Ryan Aeronautical, on the alert for ways to get better production at least cost, cut expense of this operation by at least 50% . . . with DELTA Air Powered Hydraulic Drill Units . . . for fully automatic multiple operations.

You'll appreciate "Why" when you check these 12 reasons:

1. Quick set-up . . . No cams used.
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11. Can be mounted in any position.
12. Completely versatile—infinite variations of control.



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# TRADE LITERATURE

Free Booklets and Catalogs  
Convenient Request Card on Page 133

## Pressure Gage

Folder, PG-2, presents details concerning mechanical pressure gage designed for accuracy to 1.0 percent of indicated reading. Well illustrated to show instrument in variety of uses; includes dimensional drawings. **W. C. Dillon & Co., Inc.**, 14620 Keswick St., Van Nuys, Calif. **L-7-1**

## Boring

Line of precision boring machines described and illustrated in 16-page catalog 31205, designed especially for purchasing men and engineers. Emphasizes details and special features of machines and also includes complete specifications. **Ex-Cell-O Corp.**, 1200 Oakman Blvd., Detroit 32. **L-7-2**

## Filtration

Series of printed case studies report specific accomplishments of industrial plants operating with company's filtration equipment. Well illustrated to show details. Outlines original problem, and how the equipment was used in the solution, and consequent advantages. **United States Hoffman Machinery Corp.**, 105 Fourth Ave., New York 3. **L-7-3**

## Cylinders, Hydraulic

Bulletin No. 52-55 "Vickers Hydraulic (Oil) Cylinders" incorporates up-to-date specifications and engineering information on complete line of hydraulic cylinders for industrial machinery. Extensively illustrated with photos, drawings and diagrams. Industrial Products, **Vickers Inc.**, 1416 Oakman Blvd., Detroit 32. **L-7-4**

## Belt Grinding

"Wherever There's Industry" contains 46 case studies on abrasive-belt methods which effected savings on machining operations in various industries. Well illustrated. **Porter-Cable Machine Co.**, 23 Exchange St., Syracuse, N. Y. **L-7-5**

## Foundry Shakeouts

Recently introduced medium duty foundry shakeout (in four sizes with capacities up to 5000 lb) is described in illustrated in Booklet 2438 which emphasizes its main features. Drawings and specification tables give engineering details. Also includes similar information for heavy duty models with capacities up to 30,000 lb. **Link-Belt Co.**, 307 N. Michigan Ave., Chicago 1. **L-7-6**

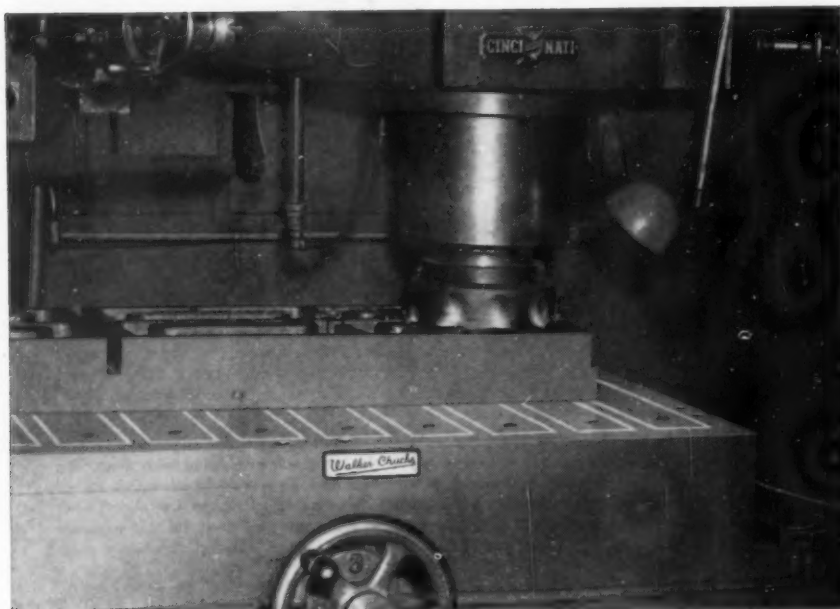
## Hardware

More than 300 items in company's line described in Catalog No. 21. Includes several of their new joining accessories such as socket head type shoulder screws, tiny size press type jig feet, 1/4 through 1 in. heavy and spherical flanged nuts and washers, etc. **Northwestern Tool & Engineering Co.**, Dayton 3. **L-7-7**

## Trimming Dies

Brochure offers detailed description of main points concerning company's line of trimming dies for flat edge trimming and notching of drawn shells; drawings clarify text. In addition, includes specification table, and also photos to show models in action. **Brehm Die Div., The Steel Products Engineering Co.**, Springfield, Ohio. **L-7-8**

## Walker Does It Again—



Milling machine operating a carbide cutter 660 f.p.m.; table feed 25 i.p.m. on rough steel castings. Walker Magnetic Chuck, securely holding workpiece, increases production equivalent to work of four planers. Take advantage of modern Walker methods for increasing production, reducing cost.

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*Original Designers and Builders of Magnetic Chucks*

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### Gear Grinding

Illustrated catalog GG-52 deals with reciprocating gear grinding machine for producing precision ground helical and spur gears. Drawings and photos show details of equipment; includes specifications. **The Sheffield Corp.**, Dayton 1, Ohio. **L-7-9**

### Motors and Controls

"Machine Tool Electrical Handbook" contains engineering information in detail to simplify selection of motors and controls for machine tools. Data covers motor application, a-c and d-c motors, adjustable speed motors, drives, motor braking, control application, motors and starters. Completely organized for quick access to the information. Includes photos, diagrams and drawings, specifications, in addition to excerpts from National Electrical Code, wiring symbols, markings and designations. Request only on company letterhead, giving title or job classification. Industrial Dept., **Westinghouse Electric Corp.**, P. O. Box 2278, Pittsburgh 30.

### Resistance Welding

Illustrated catalog contains full information on recently designed tips and holders added to line of resistance welding equipment. Incorporates reference tables, comparative charts giving physical properties, applications and RWMA specification data. **Ampco Metal, Inc.**, 1745 S. 38th St., Milwaukee 46. **L-7-10**

### Optical Tooling

Engineers concerned with optical tooling instruments and accessories for aircraft construction are offered information in the form of three bulletins: No. 808, Sup. I, Alignment Telescope; No. 808, Sup. II, Optical Square; No. 808, Sup. III, Optical Tooling Accessories. **Farrand Optical Co., Inc.**, Bronx Blvd. & E. 238th St., New York 70. **L-7-11**

### Indexing

Folder introduces company's Type K Handexer, a hand-operated diamond tool indexing device for cylindrical grinders, pointing out its special features and advantages. **Koebel Diamond Tool Co.**, 9456 Grinnell Ave., Detroit 13. **L-7-12**

### Milling Machines

Illustrated brochure presents company's No. 2-24 automatic milling machines outlining highlights of their design and illustrating and describing special features; includes dimensional drawings and tables of specifications as well as discussions of extra cost equipment. **The Cincinnati Milling Machine Co.**, Cincinnati 9. **L-7-13**

### Controllers

Catalog 1530 offers 56 pages of facts about ElectroniK controllers instruments for measuring and controlling process variables. Includes detailed specifications and control action descriptions and ratings for both electric and pneumatic types. Also presents data on Electr-O-Line and Electr-O-Pulse electric control relays. **Minneapolis-Honeywell Regulator Co.**, Brown Instruments Div., Wayne and Windrim Aves., Philadelphia. **L-7-14**

### Slitters

Seventy-five-page brochure offers basic information on design, selection and operation of slitting equipment for coil and sheet, with time studies and analysis of operating cycle. Also gives extensive engineering data on rotary gang slitters, uncoilers, scrap choppers, recoilers, coil cars, unloaders. Includes photos, engineering and dimensional drawings and specifications. **The Yoder Co.**, 5500 Walworth Ave., Cleveland 2. **L-7-15**

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**Close Fixed Center Multiple Head with Suspended Bushing Plate.**

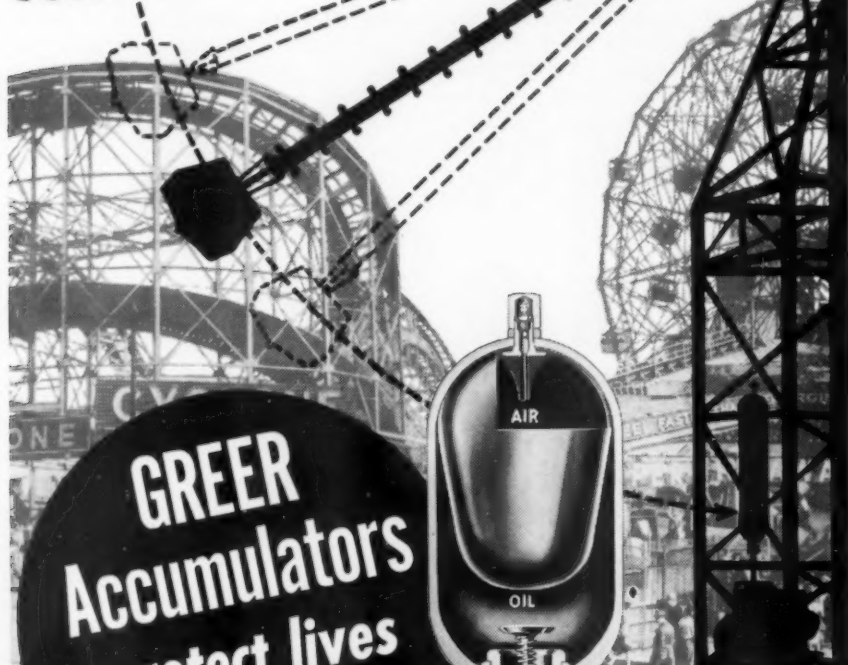
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**GREER**  
Accumulators  
protect lives  
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Hurricane Ride, Coney Island, showing normal and induced planes of rotation.

## Functions Performed by GREER ACCUMULATORS

1. PRESSURE STORAGE CHAMBER to provide
  - a. Main source of hydraulic power.
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  - a. Leakage compensation.
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Greer Accumulators play a vital part in controlling the operation of the Hurricane Ride in Coney Island. After the cars attached to 30-ft. arms attain normal speed of rotation, an operator thrills the passengers by abruptly raising and lowering the cars above and below their normal plane of rotation by means of a 4-way valve. Should the hydraulic circuit fail, the accumulator would provide emergency power to prevent wreckage due to uncontrolled swing. Another accumulator is used to smooth out pressure fluctuations.

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Sales Representatives in Principal Cities

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## Steel

Eight-page bulletin, "Cold Finished Carbon Steel Bars—guide to selection, use and relative cost," describes finishing processes used in production and their effect on mechanical properties and machinability. Discusses major characteristics and relative cost of different analyses and their suitability for carburizing or direct hardening. Table of average properties and machining speeds permits quick comparison of low and medium carbon cold finished steel bars of varying analyses. **Joseph T. Ryerson & Son, Inc.**, Box 8000-A, Chicago 80. L-7-16

## Container Making

Widely illustrated brochure 36-A contains specifications and descriptive data on for both automatic and semi-automatic machines for can and container making, including slitters, body-makers, seamers, flangers, bead-ers and testers, plus several special-purpose machines. **E. W. Bliss Co.**, Canton, Ohio. L-7-17

## Comparator Charts

Leaflet describes use of Flexo-Charts for optical comparisons, outlining special features and advantages. **Derrick Johnson Distribution and Sales, P. O.** Box 1174, Erie, Pa. L-7-18

## Molding

Brochure on nylon molding powder presents 30 case histories emphasizing the success of its use in various fields including extensive application for mechanical parts, as well as electrical and other industrial uses. Explains its properties and advantages. **E. I. du Pont de Nemours & Co., Inc.**, Wilmington 98, Del. L-7-19

## Aluminum

"Aluminum in Materials Handling" presents reprints of six articles reporting results of survey covering some 50 manufacturers and users. Request on company letterhead. **The Aluminum Assn.**, 420 Lexington Ave., New York.

## Brazing

Technical information on "Silver Brazing Preforms" published as a result of considerable research aimed at solving complicated brazing problems and selection of proper preforms. Discusses advantages and economies of preforms, illustrating various points with photos or drawings. Also includes ring weight calculating chart, a chart of recommended rings for particular cases, and lists line of silver brazing alloys with their chemical content and physical characteristics. **Lucas-Milhaupt Engineering Co.**, Cudahy, Wis. L-7-20

The Tool Engineer



a few typical examples of how

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**IN HIGH SPEED or CARBIDE**

Whether you have a tough cutting tool problem or just an ordinary "special" why not find out how Spiral can give you maximum tolerance control . . . and longer tool life with a Spiral Tool especially designed to simplify a given operation or to combine several operations into one.

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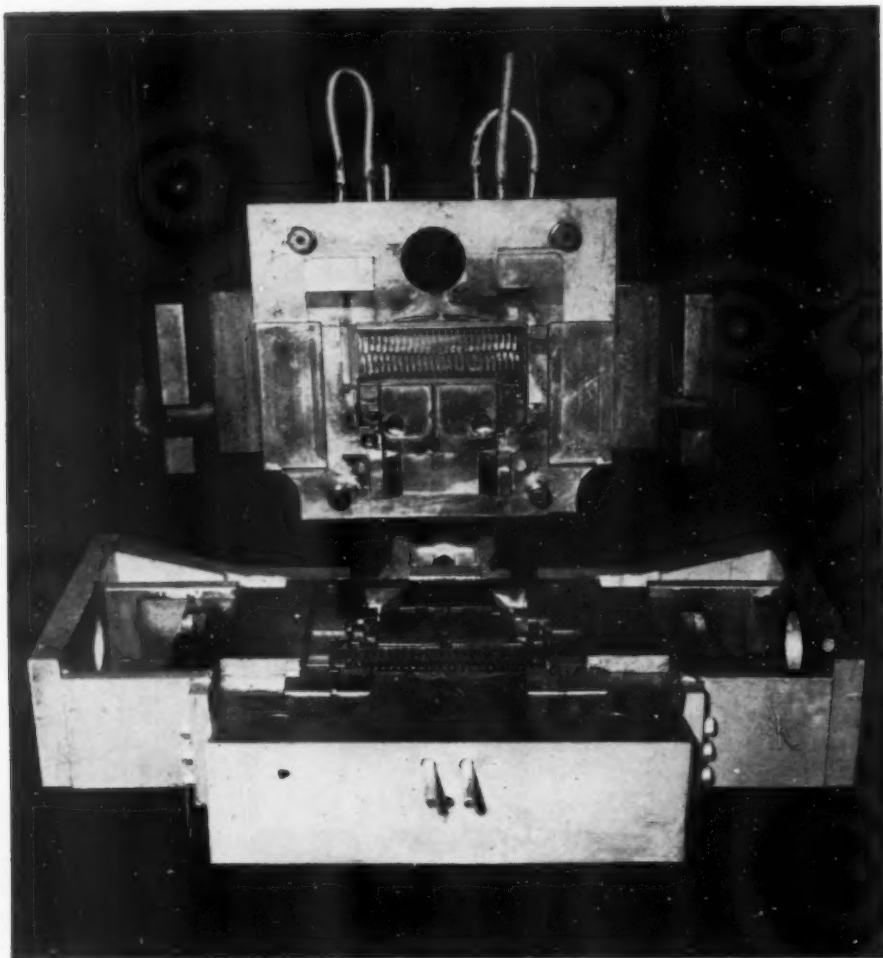
For a quick answer to your specific cutting tool problems, send complete details, including tool, part print and specifications. Write for a free copy of latest bulletin showing other examples of SPIRAL time-saving tools.



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## Accuracy calls for POTOMAC M Hot Work Die Steel

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In the precision casting of aluminum, POTOMAC M Hot-Work Die Steel is especially favored as the material for die-casting dies because its properties help assure accuracy of the steel itself *after* heat treatment. Die makers have found that size changes are held to a minimum. Dimensional stability is thus the *first* contribution that POTOMAC M makes to accuracy.

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resistance of POTOMAC M to wear, to heat checking, and to metal wash.

Allegheny Ludlum makes a complete line of steels for hot-work tooling of various kinds—so, whether your need is the mass producing of duplicate parts or fabricating a few of them, call up or write "A-L" every time for hot-work counsel or service or both. Just tell us your requirements.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For complete MODERN Tooling, call  
**Allegheny Ludlum**

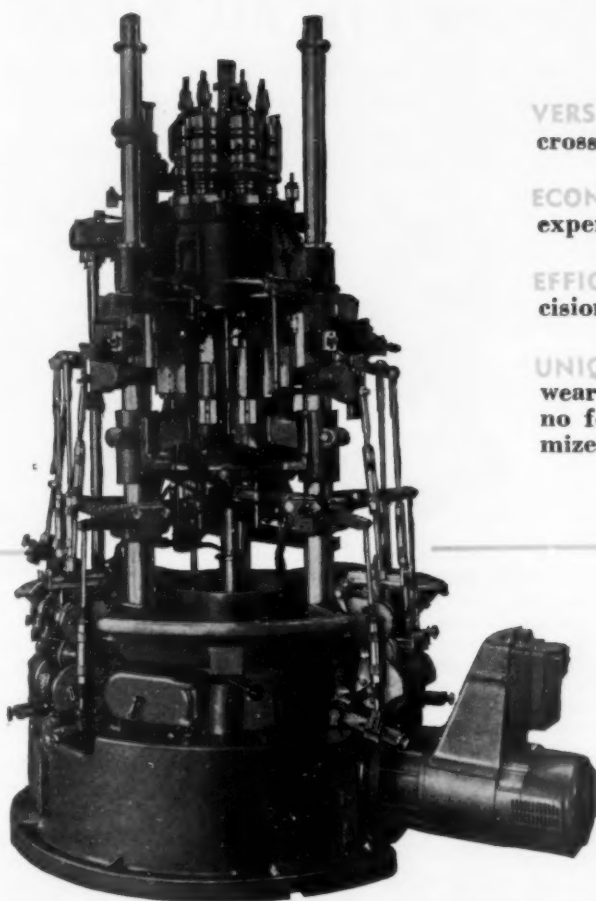
W&D 3724





**GYROMATIC**

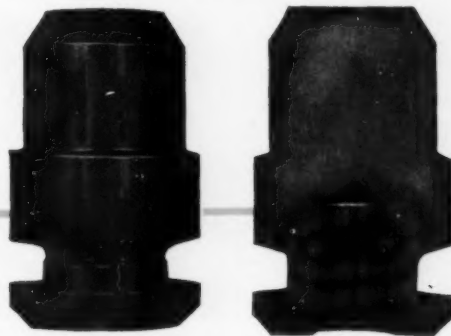
TAVANNES

**THE  
IMPROVED 6-SPINDLE****PRECISION****AUTOMATIC  
LATHE****GYROMATIC SIX-SPINDLE VERTICAL LATHE**

(Shown without bar carrier and oil guards)

**VERSATILE** —SIX rotating end tools and SIX cross tool slides.**ECONOMICAL** —Both in tooling and set-up expense; uses comparatively little floor space.**EFFICIENT** —High production, with built-in precision to meet exacting standards.**UNIQUE DESIGN** —Vertical arrangement reduces wear of moving parts. Gravity bar feed requires no feed fingers, reduces load on spindles, minimizes vibration and noise.**CHUCKING OPERATIONS**

... can also be performed to great advantage. Vertical design permits easier loading and holding of work pieces.

*Typical work piece taken from bars; capacity of 2 $\frac{5}{8}$ " dia. and 6" long.*AMERICAN  
REPRESENTATIVES**RUSSELL, HOLBROOK & HENDERSON, INC.**

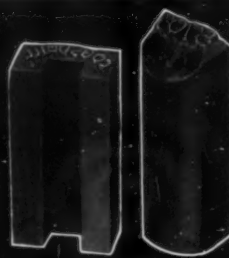
292 MADISON AVENUE, NEW YORK 17, N. Y.

## MACHINE STAMPING AND EMBOSsing DIES

Higher production with CADILLAC Dies is assured by special steel selection, controlled heat treatment and precision engraving — noted for accuracy and high quality. We'll be glad to advise you on best marking methods.



FORGING HAND STAMP



DIE INSERTS



EMBOSSING DIE



PUNCH PRESS DIE



ROLL SEGMENT DIE



SOLID ROLL DIE

## HEAVY BEVEL STEEL LETTERS AND FIGURES

The faces of CADILLAC Steel Letters and Figures combine a high degree of hardness with toughness, insuring exceptionally long life. Each stamp is clearly marked with character designation and size. Long tapering bevels assure easy alignment of characters. (To the right, note CADILLAC's sturdily boxed Interchangeable Steel Type Set.)

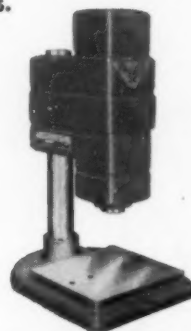
# For Perfect Product Identification There Are CADILLAC MARKING DEVICES Designed For ALL Marking Needs

Just as "variety" is called "the spice of life", varieties of marking methods and devices are essential for meeting modern production demands. CADILLAC STAMP COMPANY is equipped to offer or build every conceivable type of marking device, from simple hand stamps to especially created and designed machinery for unusual marking requirements.



## CADILLAC 115 HAND MARKING MACHINE

For general purposes this floor type machine gives top service. Marking is done in a rolling operation—requiring minimum pressure. Marks flat or round parts of varying thickness. Foot pedal for marking flat or irregular contoured parts; table screw adjustable for round parts.



## CADILLAC 52 AIR IMPACT PRESS

For high speed marking, assembling, branding, staking, crimping, riveting, also for producing light stampings. The 52 effects great savings in production—delivers speeds up to 10,000 strokes per hour—pressure up to 8 tons. Safe to operate, automatic controls. Can be hand, foot or electrically actuated.

Machines Above, Write for Bulletin M-120  
Misc. Items, Write for Bulletin SE-130.



## CADILLAC 45 HYDRAULIC MARKING MACHINE

Here's a compact, self-contained, mark fold mounted, hydraulic unit. One control gives full range of marking depth. It will mark round, flat and irregular surfaces. Machine capacity is up to 110 one inch impressions per minute.



HAND STAMP NUMERALS



INTERCHANGEABLE TYPE AND TYPE HOLDER SET



HAND STAMP SYMBOLS



Marking Devices

# CADILLAC STAMP COMPANY

Factory and Offices

17313 Ryan Road

• FO. 6-0500 •

Detroit 12, Mich.



# Smoother operating!..

because they have the lowest coefficient of friction of any cylinder

For efficient performance at low pressure, the O-M Cylinder really stands out! Smoothness of bore (4 to 7 micro-inches), and self-adjusting packing reduce friction . . . floating-cushion noses eliminate binding, dragging, jerking. This assures a smoother stroke at low or high speeds.

Every O-M Cylinder is All Cylinder! Interlocking mechanism does away with projecting tie rods and end caps, saving up to 1/3 installation space, and permitting the use of a more powerful cylinder for the job. Easier to install and repack. End plugs tapped for universal mounting. All machined steel, with bearing bronze (no castings)—easily turned down to fit in deep recesses of machines or bases.

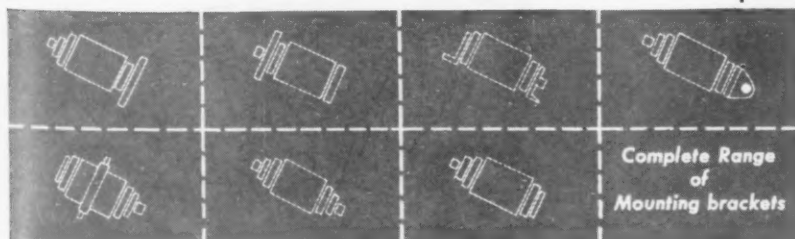
#### 14-DAY DELIVERY ON MOST SIZES

Available in a full range of sizes (1½" to 8" bores) with standard, 2 to 1 or oversize rods. Completely interchangeable parts.

## O-M air • hydraulic CYLINDERS



Write today for FREE catalog and complete set of ½ and ¼ scale templates showing all cylinders and mounting brackets.



Complete Range  
of  
Mounting brackets

interchangeable bore for bore

**ORTMAN-MILLER MACHINE CO.**  
1216 150th Street, Hammond, Ind.

- ☐ Please send latest O-M Catalog
- ☐ Please send Complete Set of Templates

Name \_\_\_\_\_ Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

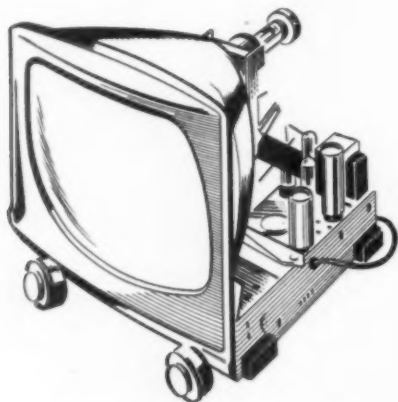
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_





UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for

nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used...on radios, television sets and electronic equipment.



On refrigerators, washers, other household appliances

*Our Fiftieth Year* : A START FOR THE FUTURE



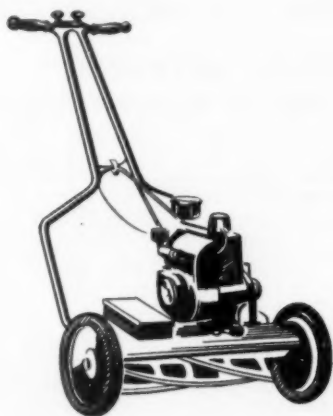
## 9 times out of 10 a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for a copy of UNBRAKO Standards. SPS, Jenkintown 37, Pa.

**UNBRAKO**® SOCKET SCREW DIVISION

**SPS**

JENKINTOWN PENNSYLVANIA



On power mowers, power saws and other power tools.



UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

# APEX TOOLS

INSERTED-BLADE MILLING CUTTERS  
AND SINGLE-POINT TOOLS FOR  
ALL METAL-CUTTING NEEDS



## APEX TOOL BITS FIT MOST STAND- ARD HOLDERS



If you haven't yet changed to Apex, you can begin to get acquainted by using Apex Bits in your present holders. The Apex line includes Single-Point Round Shank (as shown) and Shankless Serrated — plus Inserted-Blade Milling Cutters of all different styles. Write for catalog.



PROMPT SHIPMENT  
FROM OUR LARGE  
COMPLETE STOCK

APEX TOOL & CUTTER CO., Inc., Shelton 16, Conn.

USE READER SERVICE CARD; INDICATE A-7-154-1



## INDIVIDUAL VULCAINAIRE DUST COLLECTING UNITS

Are used on surface and other grinders where grinding dust must be removed.

Inexpensive, compact units, with no moving parts. Operated from your present air supply.

Installed in a few minutes, eliminating need for costly centrally located dust collecting systems.

The collector element is mounted on the side of the machine. Quickly cleaned, requiring no refills.

Vac-suction pick-up device (vacuum nozzle) is mounted on the grinding wheel guard or close to grinding wheel on other applications. This mounting permits constant contact with dust as the wheel is moved up or down.

A simple needle valve operates the unit, and can be shut off whenever the machine is not in use.

Available in two sizes: 700 series for grinding wheels 7" dia. or less—200 series for wheels 2" dia. or less.

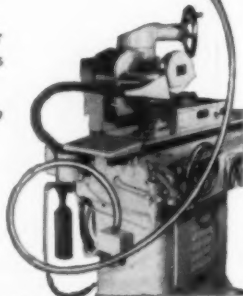
Made by the makers of Vulcanaire The jig grinding attachment.

Write on your letterhead  
for "Dust Collector" Booklet.

## VULCAN TOOL CO.

7300 Lorain Street, Dayton, Ohio

USE READER SERVICE CARD; INDICATE A-7-154-2



# "M-B" Model SS-SR 100,000 RPM SUPER-SPEED Pneumatic GRINDER



The only hand grinder with spindle speed of 100,000 R.P.M. on 100 pounds of air pressure. It has revolutionized hand grinder performance. Can be directed in any working position; operates with extreme ease. Steel construction throughout. Formed to fit the hand. Weighs only 14 ounces.

Also  
Other  
Models

"Remember, Built-in Quality Remains  
Long after First-cost Disappears"

Representatives in Principal Cities

Also Automatic  
Air Line Filters,  
Regulators and  
Lubricators

Write for Literature

**M-B PRODUCTS**  
46 Victor Ave.  
Detroit 3, Michigan

USE READER SERVICE CARD; INDICATE A-7-154-3



## WILSON "ROCKWELL"\*\*\* the Jewel of Hardness Testers

• Always the leader... recognized and respected. Its quality has been imitated, but never attained. The WILSON "ROCKWELL" sets itself apart—stands alone—as the jewel of Hardness Testers. WILSON accepts the responsibility of leadership.

Be sure. Look to WILSON for the hardness testers you need. Don't be satisfied with anything less than a genuine "ROCKWELL." It may cost less than you think. Write for literature and prices.

ACCO

\*Trade Mark Registered



WILSON MECHANICAL INSTRUMENT DIVISION  
AMERICAN CHAIN & CABLE

230-H Park Avenue, New York 17, N. Y.

USE READER SERVICE CARD; INDICATE A-7-154-4

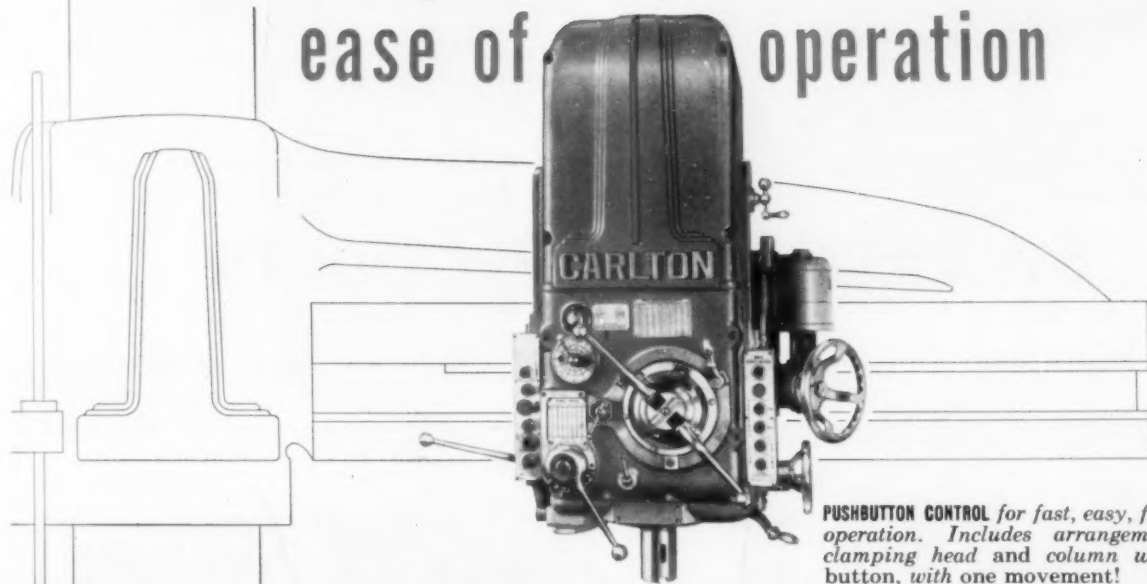
**WILSON**  
"ROCKWELL"  
and TUKON  
Hardness  
Testers



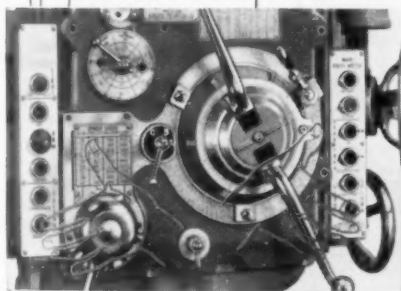
# Only ONE can be called the Finest: **Carlton**

...here's another good reason why:

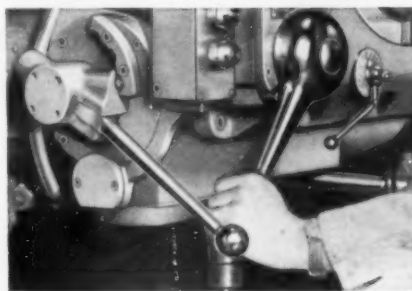
## ease of operation



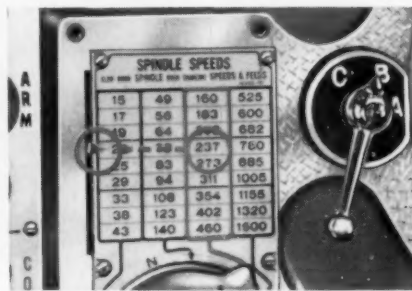
**PUSHBUTTON CONTROL** for fast, easy, foolproof operation. Includes arrangement for clamping head and column with one button, with one movement!



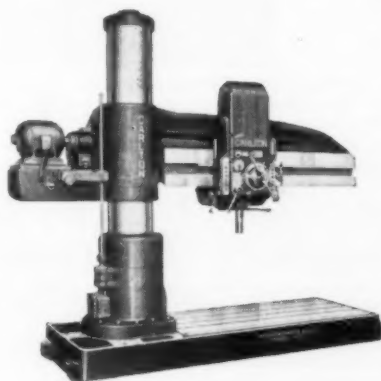
**2-HAND CONTROL** ... everything located within the arcs of a man's two hands. No groping. No fumbling. No lost motion ... every move counts. Saves time and energy.



**2 LEVERS** ... not three, but 2 levers control 36 spindle speeds. Simplified 2-lever control shortens machining cycle. More speeds mean wider range, more selectivity.



**SHIFT FROM DIRECT READING SPEED PLATE.** All 36 spindle speeds located instantly. No complicated 3-lever position charts to decipher. Spindle speed setting shown: 237 rpm.

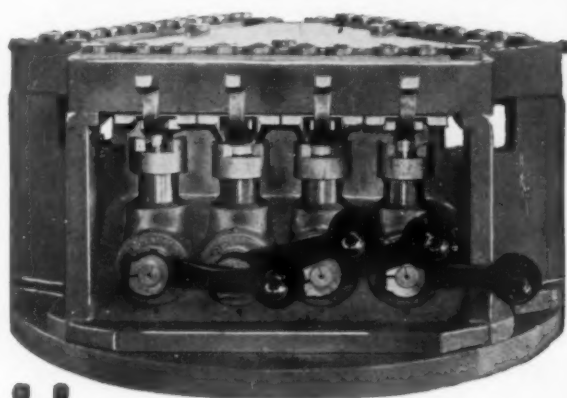


**NO OTHER RADIAL DRILL** has pushbutton control ... it's a Carlton exclusive.

No other radial drill can offer such easy, speedy operation.

No other radial drill can offer this combination of design, construction and operating advantages: pushbutton control, low hung drive, modern lubrication, 3-unit power clamping. There are many others, too numerous to mention here. Why not write us today for "the hole story." **THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO.**

# ALL TYPES OF HOLDING FIXTURES



THREE STATION INDEX FIXTURE FOR DRILLING HOLES IN UNIVERSAL JOINT YOKE. PARTS ARE CLAMPED AGAINST TOP PLATE IN ORDER TO CONTROL THE DEPTH OF MACHINED HOLES.

## FOR MACHINE SHOP PRODUCTION

### REPRESENTATIVES:

SYRACUSE  
Arthur Irvine  
CLEVELAND  
Production Tool Co.  
MILWAUKEE  
Geo. M. Wolff Co.  
HOUSTON-DALLAS  
Engineering Sales Co.  
CHICAGO  
Ernie Johnson & Co.  
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Tool Engineer Products  
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Morgan Tool Equipment Co.

LOS ANGELES  
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NEW ORLEANS  
Engineering Sales Co.  
CINCINNATI  
R. W. Pratt  
BOSTON  
A. R. Shevlin & Co.  
TOLEDO  
Peerless Tool Service Co.  
CANADA  
Firth Brown Tools, Ltd.  
Galt, Ont.

WRITE FOR CATALOG 941

## SWARTZ TOOL PRODUCTS

Division of Jefferson Box Co.

13330 Foley Ave.

Phone WE 3-1522

Detroit, Michigan

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-156-1

# WHO

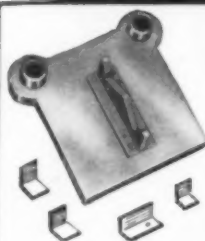


makes the finest in  
CAP SCREWS • SET SCREWS • MILLED STUDS  
and COUPLING BOLTS

*Wm. H. Ottumiller Co.*  
YORK, PENNA.

USE READER SERVICE CARD; INDICATE A-7-156-2

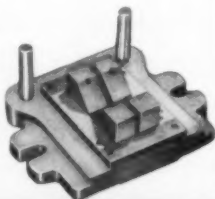
## Punches and Dies



Send for  
free illustrated  
catalog No. 152 B.

### Angle Iron Cut-Off Die

Mounted in leader pin die set. Fits most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Just one of our many standard stock-dies.



**WARD Machinery Co.** 564 West Washington Chicago 6

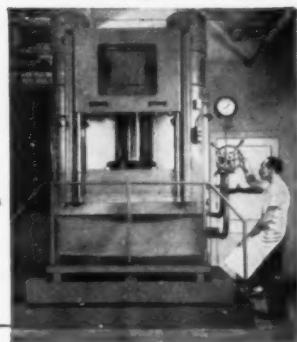
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## Important addition

TO SUMMIT-ROBERTS TOOL CO.

... a 2500 ton hobbing press

For over 20 years we have hobbled cavities in only the highest quality hobbing steel. Now, by industry demand we offer our services to cold hobb your cavities for



MOLDS for Plastics

Die casting Dies

We can make the hobbs or use yours.

Visit our plant personally and inspect our modern facilities, where you will see one of the most unusual, outstanding and fully equipped shops in the country.



**Summit-Roberts Tool Co.**

830 NEW YORK AVE. • TOLEDO, OHIO

USE READER SERVICE CARD; INDICATE A-7-156-4

# There's a reason 76%\*

of all popularly-priced Tool and Cutter Grinders sold in 1952 were "Knock-Outs"



MODEL B860

Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

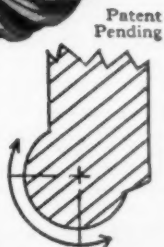
**K. O. LEE CO.**  
ABERDEEN, S. D.

USE READER SERVICE CARD; INDICATE A-7-157-1

## Douglas' HI-HELIX Milling Cutter Shears Costs



Top performance on many applications is being proved by reduced cutter breakage • longer life • improved workpiece finish • increased cutting rates • less down-time. These advantages are the result of the HI-HELIX shearing action and add up to IMPROVED PERFORMANCE at LOWER COST. HI-HELIX cutters are available in sizes from 3/4" to 5" — body design optional. Write for Engineering Bulletin. Inquiries from representatives invited.



More than 150° cutting surface.

**DOUGLAS TOOL CO.** 2300 E. Nine Mile Rd. HAZEL PARK, MICH.

USE READER SERVICE CARD; INDICATE A-7-157-2

## Swanson TURRET INDEXING UNIT



Save time, money, and manpower in designing and building special, automatic machines for manufacturing operations on small and medium parts.

*Swanson*

These ready-made, self-contained turret indexing chassis are available in a wide range of turret diameters, speeds, and stations. By providing a "packaged" intermittent motion unit, they eliminate a large part of the time and cost involved in special automatic machine design and construction. They provide a unit ready to go to work on an infinite variety of special jobs, such as staking, punching, soldering, assembling, piercing, etc. Any operational device may be mounted in any position around the turret on standard, adjustable mounting brackets or to the stationary turret center plate. Large operational devices may be mounted on optional floor base plate. Smooth, trouble-free indexing is by uniform acceleration cross-over cam. A positive locking device guarantees accurate positioning at each work station.

Write for Bulletin T4,

The Swanson Turret Indexing Unit is one of several precision products developed and built by Swanson to help industry shoulder ever increasing manufacturing costs without impairing quality of product. In a third of a century, Swanson special machines have increased output and improved precision in hundreds of operations.

... other PRECISION PRODUCTS by SWANSON

V-Liner Inspection Unit  
V-Liner Concentricity Checking Fixtures  
Memory Devices for Automatic Machines  
Feeding Hoppers and Positioning Devices  
Filling Machines

Engineers and builders of special precision machinery



Quality since 1919

USE READER SERVICE CARD; INDICATE A-7-157-3





# Economy points to Bay State Taps

...on nearby shelves of  
industrial supply distributors.

BAY STATE TAP & DIE COMPANY • MANSFIELD • MASS.

USE READER SERVICE CARD; INDICATE A-7-158-1



## RING PUNCHES

*HARD...*

*tough...*

*concentric...*

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

### Button Dies

### Ring Type or Press Fit

Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.



Write TODAY for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

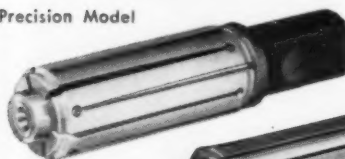
Exclusive distributor wanted for the states of Washington and Texas.

## Ring Punch & Die Co.

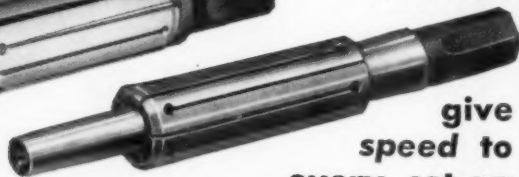
108 FOOTE AVE., JAMESTOWN, N. Y.  
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## CHAMPION E-X-P-A-N-D-I-N-G MANDRELS

Precision Model



Standard Model



give  
speed to  
every set-up

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

**Precision Model** has expansion range of .010". Available in regular sizes to fit holes from 1/2" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

**Standard Model** maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from 1/2" to 9 1/2" diam.

CHAMPION Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.

**WESTERN TOOL & MFG. CO., INC.**

Dept. 23

Springfield, Ohio

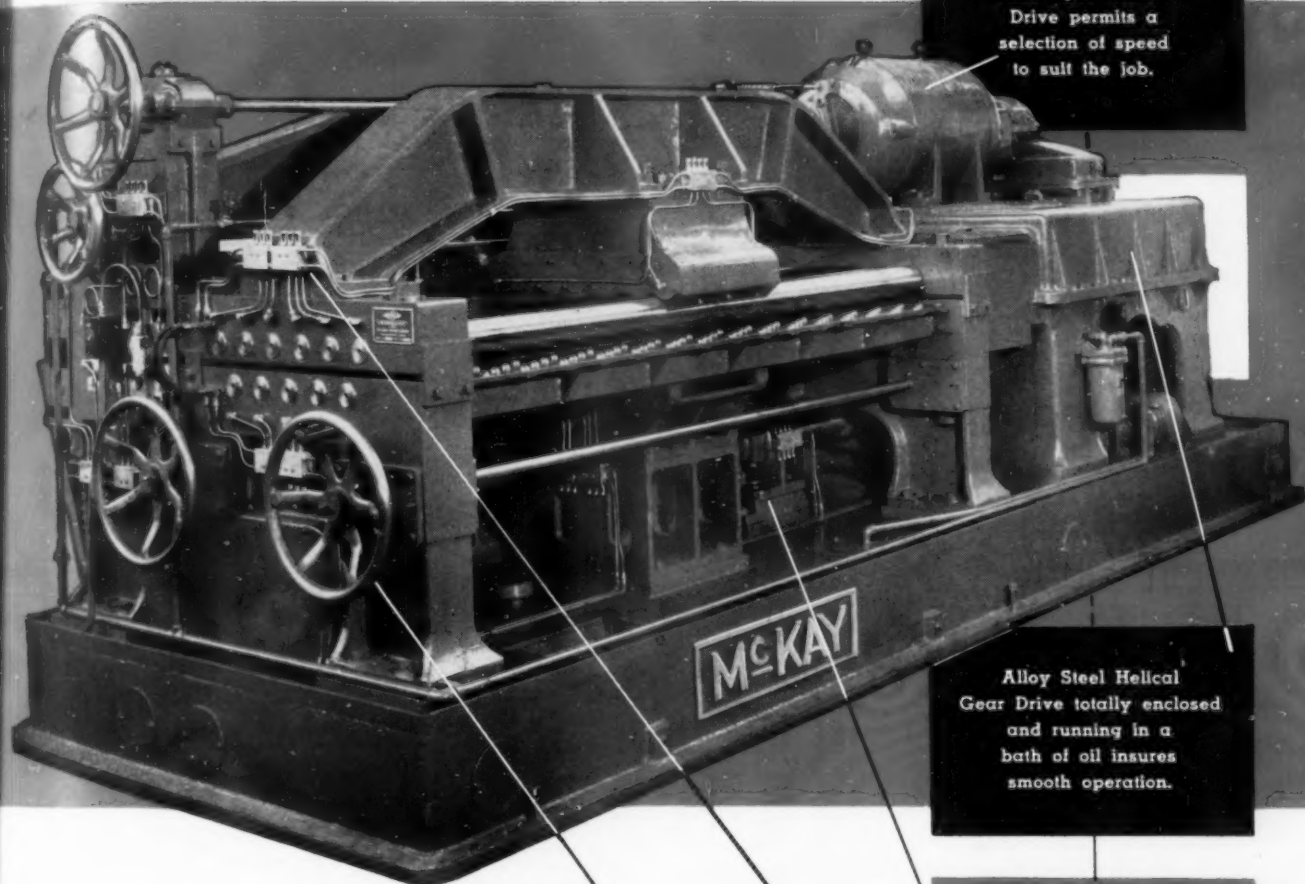
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The Tool Engineer

why do

McKay Machines

# LAST LONGER ?



Multi Speed Motor Drive permits a selection of speed to suit the job.

Alloy Steel Helical Gear Drive totally enclosed and running in a bath of oil insures smooth operation.

Rugged construction consistent with steel mill design permits continuous operation with a minimum of down time.

One shot system provides correct lubrication for all moving parts.

Compact design with all adjustments easily accessible to the operator. Engineers and Designers of Equipment for the Automotive, Fabricating and Steel Industries

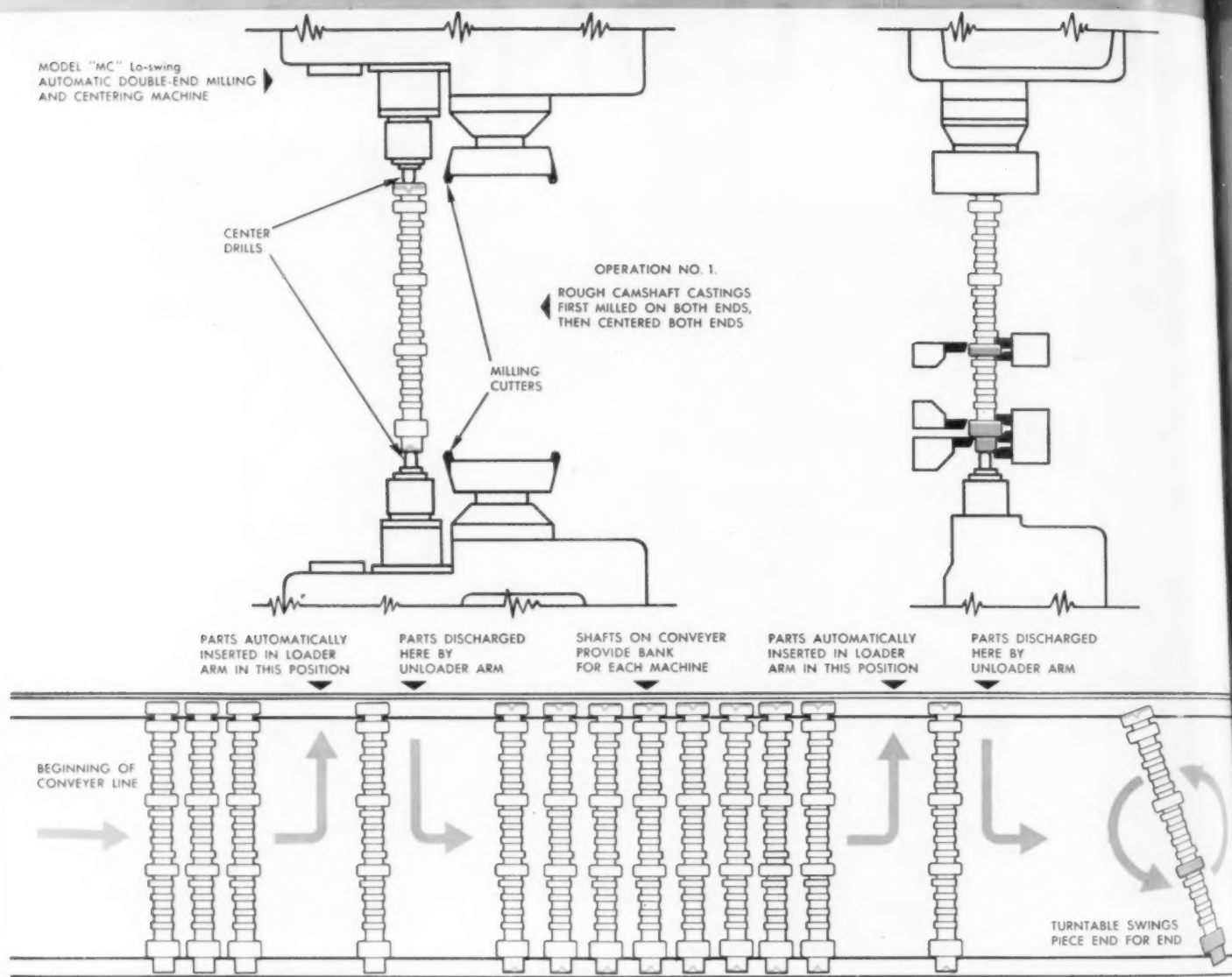
■ The McKay Flex Roll Sheet Processor is universally accepted by the automotive and stamping industries for eliminating stretcher strain and reducing scrap loss due to breakage in die drawn parts. The Processor combines a deep flex rolling under tension and a thorough cold working of the steel sheet by roller leveling, to condition it for deep drawing operations.

**McK**

**McKAY**

The **McKAY MACHINE** Company  
YOUNGSTOWN, OHIO

# MACHINE OF



## THREE-UNIT TYPE *Lo-swing* TRANSFER INSTALLATION

The installation diagrammed above illustrates the New Lo-swing principle of Work Loading and Work Transfer which offers impressive economies by carrying automation far beyond the cyclic operation of individual machines. Rough work enters this system at the left and goes through three machining and two gauging operations *automatically*. Cycle time on individ-

ual operations varies without affecting smooth operation of the installation. Safety and Quality Control Devices instantly detect and signal off-tolerance pieces.

The possibilities of this principle in the manufacture of repetitive parts are almost limitless ...the safety and economic advantages, tremendous. Your specific inquiries are invited.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

# PRODUCTION COSTS



# THE MONTH

MODEL "LR" Lo-swing  
AUTOMATIC LATHE

MODEL "LR" Lo-swing  
AUTOMATIC LATHE

OPERATION NO. 2.  
TURN THREE DIAMETERS,  
SQUARE AND CHAMFER  
AT ONE END OF CAMSHAFT

OPERATION NO. 3.  
TURN THREE DIAMETERS,  
SQUARE AND CHAMFER  
AT OPPOSITE END OF CAMSHAFT

AUTOMATIC GAUGING STATION  
FOR OPERATION NO. 2.

STATION INDICATES OUT OF  
TOLERANCE PIECES BY COLORED  
LIGHTS, RETAINS SUCH PIECES  
AND STOPS LOADER ON  
PRECEDING MACHINE AUTOMATICALLY

SHAFTS ON CONVEYER  
PROVIDE BANK  
FOR EACH MACHINE

PARTS AUTOMATICALLY  
INSERTED IN LOADER  
ARM IN THIS POSITION

PARTS DISCHARGED  
HERE BY  
UNLOADER ARM

AUTOMATIC GAUGING STATION  
FOR OPERATION NO. 3.

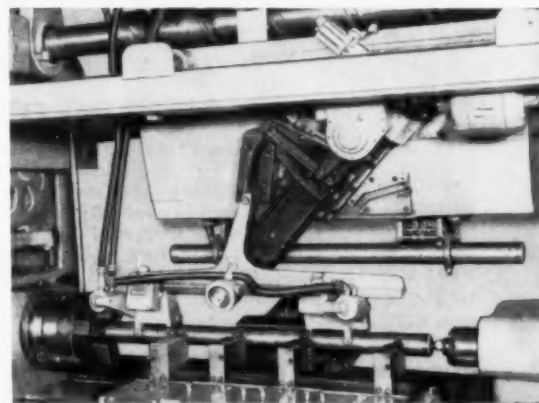
STATION INDICATES OUT OF  
TOLERANCE PIECES BY COLORED  
LIGHTS, RETAINS SUCH PIECES  
AND STOPS LOADER ON  
PRECEDING MACHINE AUTOMATICALLY

TO SUCCEEDING  
OPERATIONS

## CUTS OVERALL CAMSHAFT MACHINING COSTS

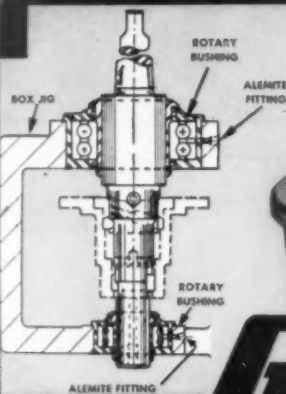
Seneca Falls Automatic  
Work Loader. Trolley at  
Work Transfer Station  
over Conveyor Line.  
Unloader Arm has dis-  
charged finished shaft.  
Loader Arm has picked  
up and is holding rough  
shaft.

Seneca Falls Automatic  
Work Loader. Trolley at  
Machine Station. Rough  
shaft just placed on cen-  
ters. Unloader Arm holds  
finished shaft for deliv-  
ery to Conveyor Line.



ARE LOWER WITH Lo-swing

**SEALED  
PRECISION  
BALL BEARING  
CONSTRUCTION**



**GATCO**  
**ROTARY BUSHINGS**

**FOR DRILLING, CORE DRILLING,  
ROUGH AND FINISHED BORING**

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

**GATCO ROTARY BUSHING CO.**

42330 ANN ARBOR ROAD, U.S. 12, PLYMOUTH, MICH.

Telephone PLYMOUTH 1472

USE READER SERVICE CARD; INDICATE A-7-162-1

**CUT DESIGN AND  
TOOLROOM COSTS**

**SAVE 1/3 OR MORE ON  
JIG and FIXTURE PARTS**



BLANK JAWS  
SINE FIXTURE  
KEYS  
SHOULDER  
SCREWS  
MALLEABLE  
HANDLES  
TEE SLOT BOLTS  
THUMB SCREWS  
TEE SLOT NUTS  
HAND WHEELS  
REST BUTTONS  
FIXTURE KEYS  
HAND KNOBS  
C-WASHERS  
STUDS, ETC.

**SPECIFY THE LINE THAT SAVES YOU TIME!**

Use Jergens mass-produced components as standard in your plant. Realize big savings in design, tool room and production facilities. Jergens makes over 400 precision parts designed to save your time and money—standards that will hold up in the toughest applications usually outlasting the jigs and fixtures on which they are used.



WRITE FOR YOUR COPY OF  
JERGENS' NEW FOLDER

**TOOL SPECIALTY CO.**

Dept. TE 712 E. 163rd St.  
Cleveland 10, Ohio

USE READER SERVICE CARD; INDICATE A-7-162-2

**Hardness testing made Easy!**

**Save Time!  
Test Accurately!**



**Ames PORTABLE  
HARDNESS TESTERS**

Frequent hardness testing of metals before and during fabrication and after heat treating is essential today for best results.

Ames Portable Hardness Testers answer the need for a light weight, accurate, dependable tester that may be carried to the work for on-the-job testing. They are easy to use, require no skill, and get speedy, accurate tests wherever the work may be—no delays, no cutting off specimens—no waiting for laboratory tests.

Besides testing flats, rounds, tubing, etc., Ames Hardness Testers make tests that otherwise would be impossible, such as large gears, knives, saws, blades, struts, frames and assembled parts. Thousands are in use paying for themselves over and over again in time and materials saved.

Send for literature or ask for demonstration  
in your plant. No obligation.



**AMES PRECISION MACHINE WORKS**

Makers of Ames Precision Lathes and Bench Millers  
Waltham 54, Massachusetts

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**EFFICIENT—LOW COST PRODUCTION**

MEANS **ROUSSELLE** PUNCH PRESSES



O. B. I. PRESS    HORN PRESS    DEEP THROAT

**SERVICE MACHINE COMPANY**

7627 S. Ashland Ave.    Chicago 20

USE READER SERVICE CARD; INDICATE A-7-162-4

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Advertisers, Trade Literature or  
Tools of Today Appearing in this  
Issue of The Tool Engineer, Use the  
Handy Readers Service Card on  
Page 133

# HYDRAULIC CONTROL OF AIR CYLINDER OPERATION GIVES ABSOLUTE SMOOTHNESS OF PISTON ROD MOVEMENT



**Model DC-50**  
Maximum Checking —  
Capacity 3000 Lbs.

**Model HC-12**  
Maximum Checking — Capacity 1200 Lbs.

WITH THE Bellows Hydro-Check you can combine the speed, economy and flexibility of air power with the smoothness of hydraulic operation. The Bellows Hydro-Check eliminates the natural "bounce" or "springiness" of air, gives an air-powered "piston rod unparalleled smoothness with complete freedom from chatter. In work or tool feeding operations the Hydro-Check can be set to provide hydraulic control

of the feed rate through the entire stroke or at any given point without affecting either rapid advance or rapid return.

The Bellows Hydro-Check, while designed primarily for use with Bellows "Controlled-Air-Power" Devices, can be used with any conventional air cylinder. It proves equally effective in providing a controlled feed rate in manual feeding operations.

*Write for Bulletins HC-600 and CL-50. See how effective this positive control of pneumatic operations can be to you. Address Dept. TE-753, The Bellows Co., Akron 9, Ohio*



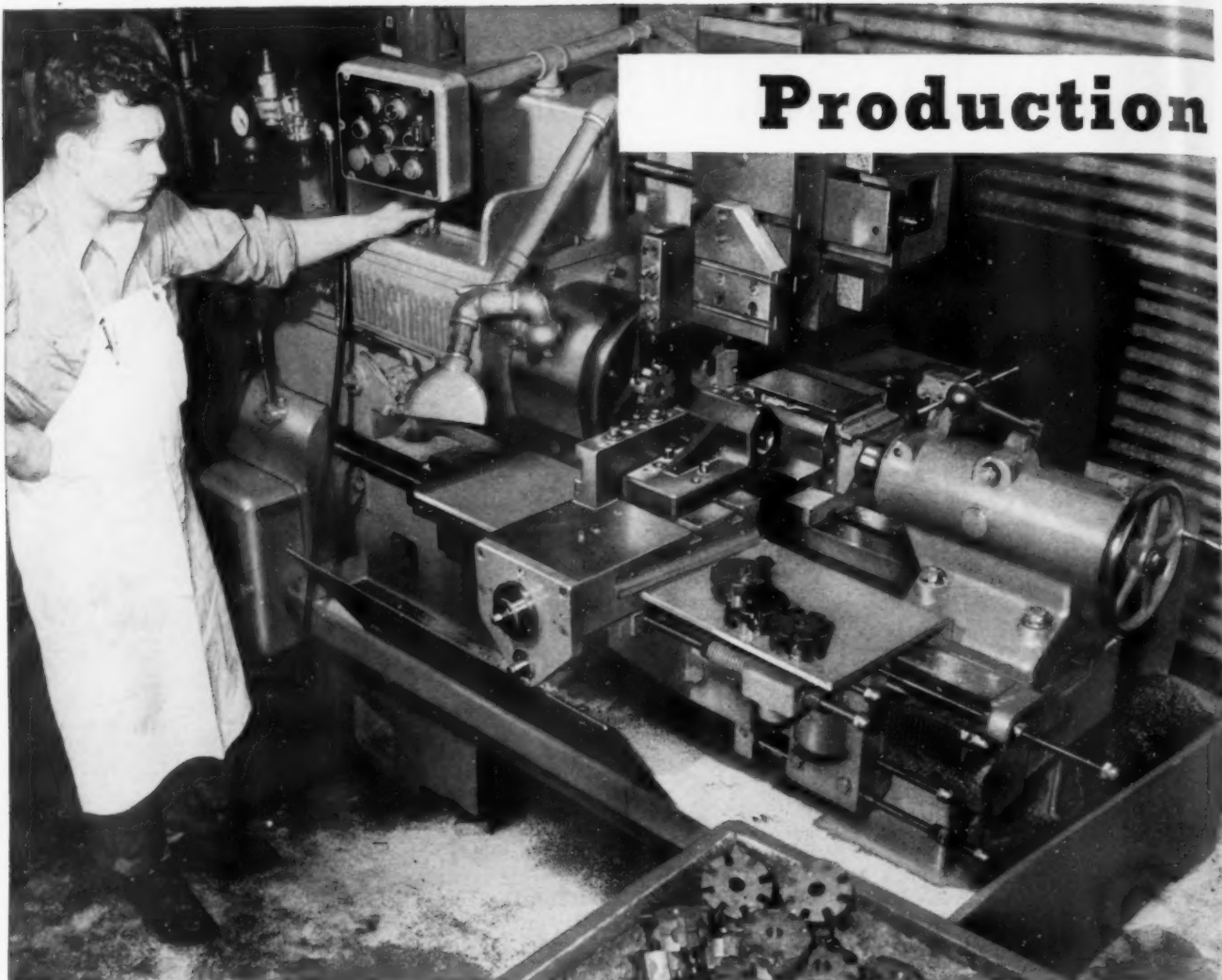
**The Bellows Co.**  
AKRON, OHIO

*Controlled  
Air  
Power*

**FOR FASTER, SAFER, BETTER PRODUCTION**

696A





## ***One Sundstrand Automatic Lathe Replaces 3 Other Machines***

Here's a Sundstrand Model 8A Automatic Lathe in operation in the Columbia Tool and Die Company of Minneapolis. It is used for turning and facing five different pump rotors and three different covers. Previously these parts were turned on three different conventional turning machines using three operations. With this one

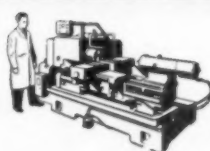
Sundstrand installation, the same amount of work is done 2-1/2 times faster. Production increases and savings like these are commonplace with Sundstrand Automatic Lathes. Investigate their possibilities on your work. A Sundstrand engineer will be glad to help. There is no obligation for this service.



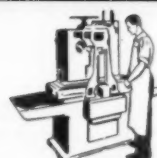
*"Engineered  
Production"  
Service\**

\*REG. U.S. PAT. OFF.

AUTOMATIC LATHES



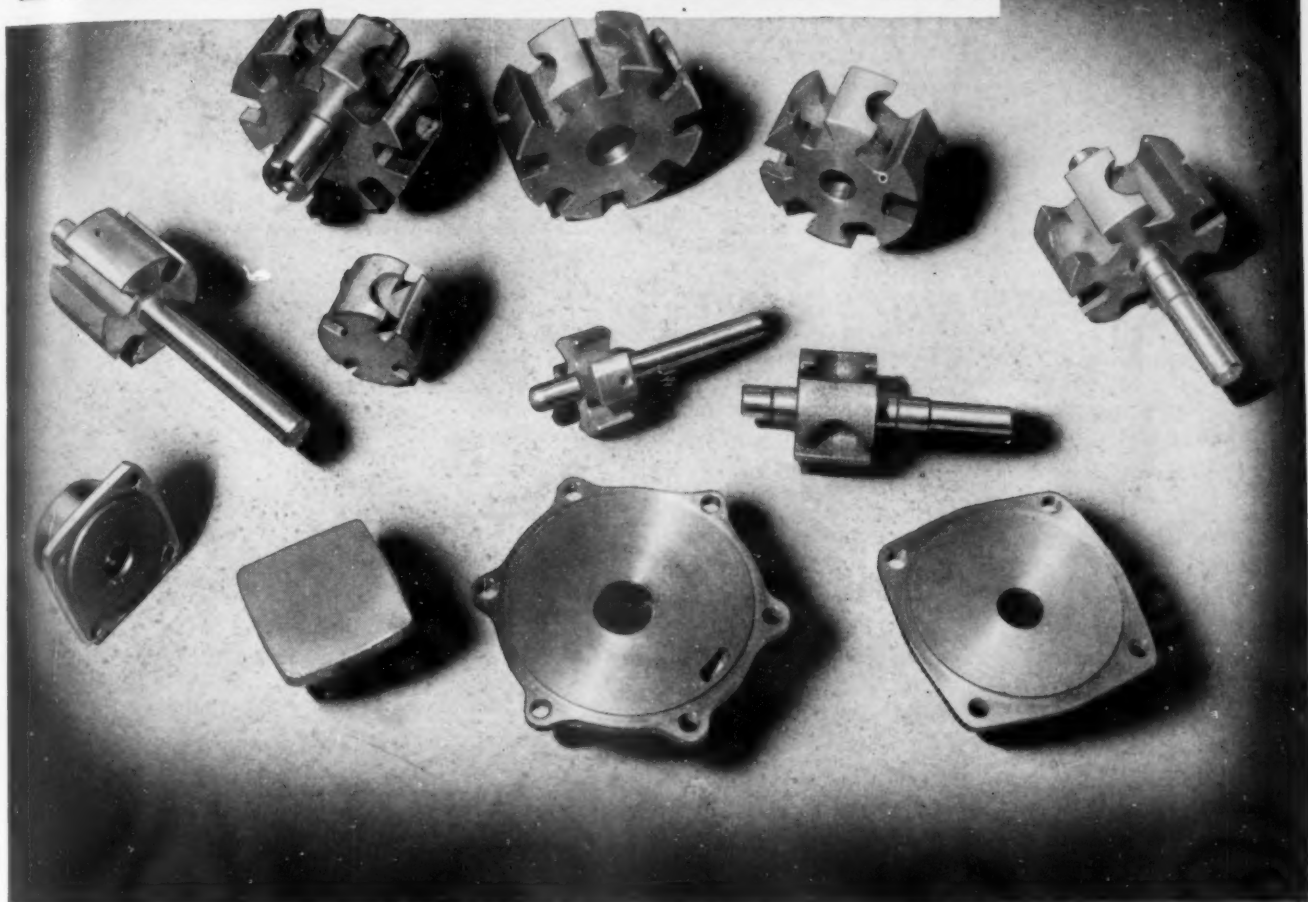
SIMPLEX RIGIDMILS



DUPLEX RIGIDMILS



# Increased 2 1/2 Times...



## ... In Lot Sizes of 100 to 500 Parts

Parts are turned in lot sizes of 100 to 500 pieces. Operations consist of . . (1) Face one side, turn 1/2 of O.D. and core drill . . (2) Face opposite side and turn opposite end . . (3) Finish face both sides. Production for each operation on parts of Ni-resist material is 60 per hour — on cast iron parts, 120 per hour.

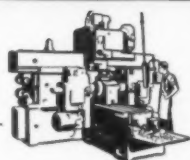
Work is held to .001" tolerance. Simplicity of set-up is the most important factor in making the multiple-tooled Sundstrand Automatic Lathes practical and profitable on short-run turning.

## Free Data

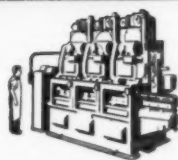
The complete line of Sundstrand Automatic Lathes includes the Models 4A, 6A, 8A, 12A and 16A ranging from 3 to 75 HP. Write for complete information on these machines today. Ask for bulletin 733.



TRIPLEX RIGIDMILS



SPECIAL MACHINES



## SUNDSTRAND Machine Tool Co.

2540 Eleventh St. • Rockford, Ill., U.S.A.

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PRECISION GROUND

OIL HARDENING NON-WARPING TOOL STEEL

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Each gleaming piece is solid, usable steel, free of decarb, accurately dimensioned, corners square, sides flat and parallel . . . all ready for the layout bench—no costly time out for "get-ready."

Over 200 standard stock sizes ranging from  $\frac{1}{8}$ " to 4" square, and from  $\frac{1}{64}$ " to  $1\frac{1}{2}$ " thick by widths up to 12" . . . in handy 18" pieces, each marked with size and brand—each in its own wrapper bearing identification, analysis and heat treatment. Special sizes and lengths made to order.

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### Warplis analysis:

Carbon	.90	
Manganese	1.10	
Chromium	.50	Preferred for ease of working . . .
Tungsten	.50	for safe hardening . . . for
Vanadium	.15	fine performance.

Procedures may be simplified . . . time and money saved . . . by standardizing on these companion products of Tiffany-like quality for all tool and die requirements. From fine steel distributors everywhere. Size and price folders, and Warplis Notes on Hardening pamphlet, on request.

Also Monaca and Dukane water hardening drill rods

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## PITTSBURGH TOOL STEEL WIRE CO.

Since 1902 . . . makers of cold finished fine steels in all sizes, grades and shapes

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Announcing a new gage that simplifies the measurement of

**SURFACE ROUGHNESS**

... the

**BRUSH SURFINDICATOR\***

*Manufactured under patent license from General Motors Corporation*



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INDUSTRIAL AND RESEARCH INSTRUMENTS  
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**COMPANY**

*formerly  
The Brush Development Co.  
Brush Electronics Company  
is an operating unit of  
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\*Trade Mark

# Here is a practical shop tool for measuring SURFACE ROUGHNESS

20



**EASY-TO-USE** ... After brief instruction, shop personnel can make accurate measurements with the SURFINDICATOR.

## ...the BRUSH SURFINDICATOR\*

With this new, portable inspection tool you can make surface roughness measurements on the production line. The operator merely guides the pickup over the piece to be inspected, and then reads surface roughness in average microinches on the meter. This permits you to specify surface roughness in the design and then to measure it in the shop.

The SURFINDICATOR is always reliable because the unit is

equipped with Precision Reference Specimens. These permit checking accuracy of the instrument at any time, and provide a set of standards for absolute calibration. Using SURFINDICATORS, several plants in different locations can produce parts to the same surface roughness specifications. Here is the instrument that makes surface roughness measurement a practical shop operation. Get the complete story on the BRUSH SURFINDICATOR now!



**PORTABLE**... Weighs only 15 pounds and can be set up anywhere in the plant where 115 volts a.c. is available. Completely self-contained.



**ACCURATE** ... Precision Reference Specimens permit calibration to an absolute standard, and enable you to check accuracy of instrument at any time.

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Brush Electronics Co., 1609 Connecticut Ave., N.W.
5. DETROIT 14, Michigan  
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Cleveland 14, Ohio

Brush Electronics Company, Dept. BB-6  
3405 Perkins Avenue, Cleveland 14, Ohio  
Please send bulletin on the SURFINDICATOR.

Your name .....  
Company .....  
Position .....  
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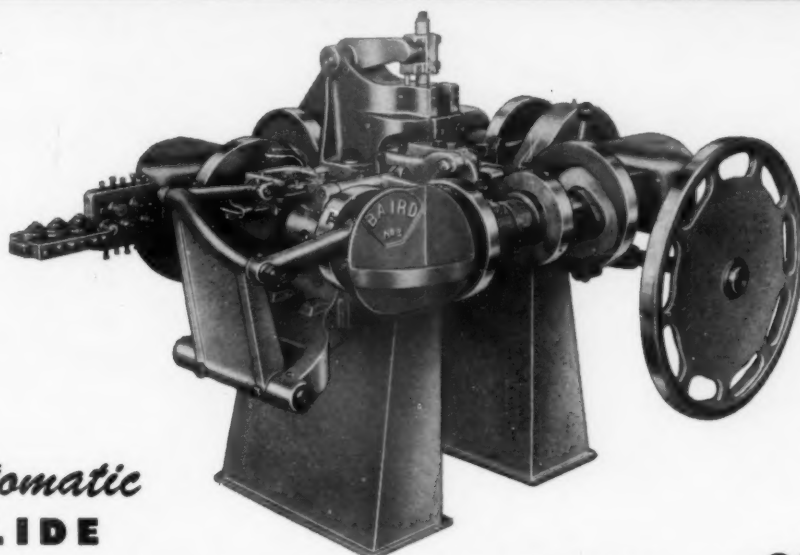
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ASK

# BAIRD

ABOUT IT!

## HIGH PRODUCTION TOOLING



### BAIRD *Automatic* FOUR SLIDE

## ... the Machine that GROWS and GROWS and GROWS

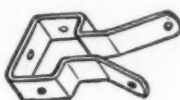
Start, if you wish, with the standard (stocked) 4-slide, which in itself is remarkably versatile in forming hundreds of articles from wire and ribbon metal.

Then when conditions demand . . . a call for even greater versatility of production or a change in certain products . . . you may add one or more attachments to the standard model, so designed

that "machine growth" is simplified and practical.

Thus, with gradual investments, you will build your Baird 4-slide to a full production unit capable of turning out the widest variety of wire and ribbon products. Here is a list of attachments easily added . . . but naturally, not all on one machine . . . as they might become too complicated.

**1**  
Horizontal Press Attachments



**2**  
Form Raising Attachment



**3**  
Pin Pulling Attachment



**4**  
Round Wire and Ribbon Metal Rings  
(Simple, practical tooling available)



**5**  
Secondary Cut-Off Attachment



**6**  
Pinch Pointing — Nail Pointing  
(Tooling to suit work and wire specifications)



**7**  
Vertical Forming and Stripping  
(New patented Baird mechanism for this work)



*Baird engineers will gladly develop tooling from your parts or specification. "Ask Baird about it!"*

*the* **BAIRD MACHINE COMPANY**  
STRATFORD • CONNECTICUT

**AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING  
MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS**

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July, 1953

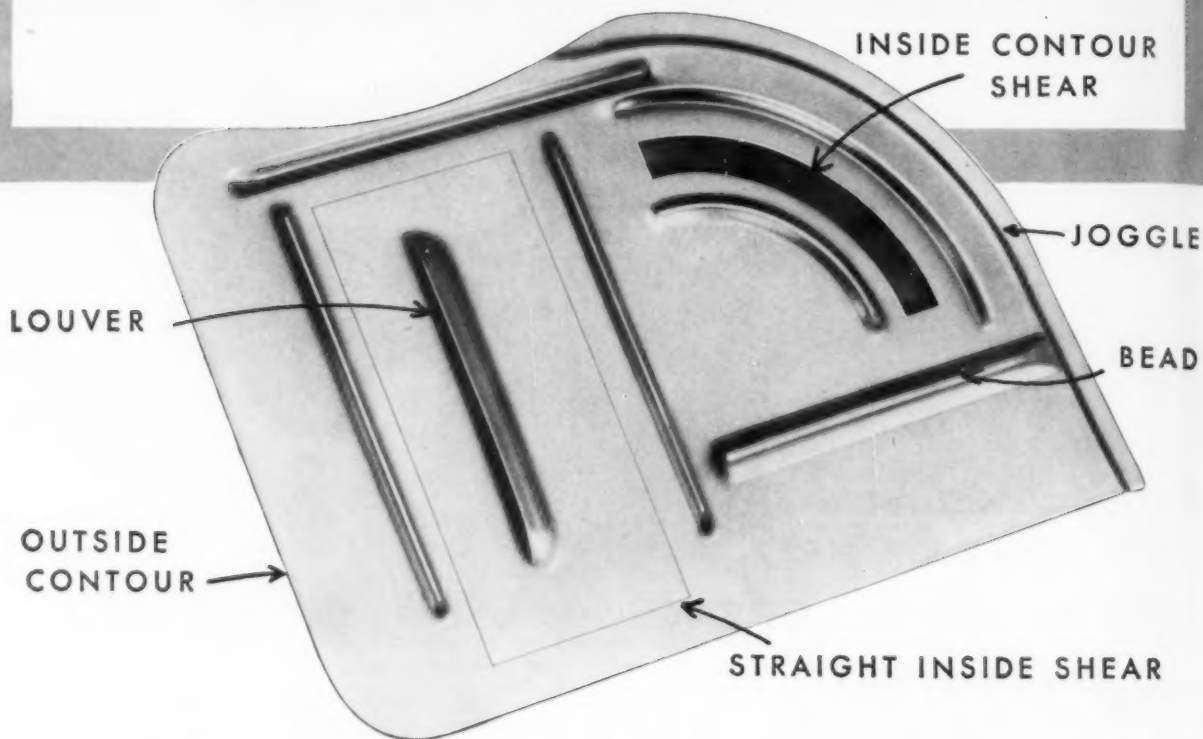
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-169

169



# WALES TRUE-EDGE SHEARS

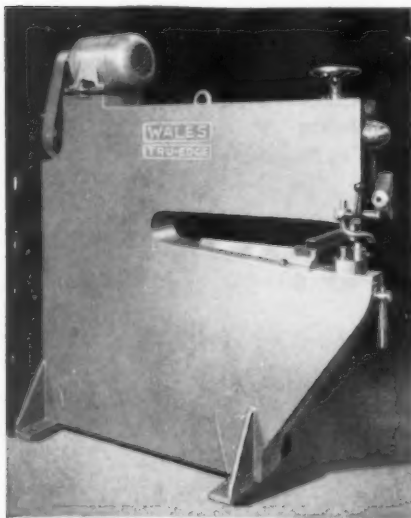
*do all these operations quicker and easier at less cost*



The many operations performed on the Wales Tru-Edge Shears make them *truly universal* machines for single pieces or production runs. Practically every metal working plant (including yours) has an everyday need for these shears.

Step up your output with increased efficiency at lower costs with Wales Tru-Edge Shears. In-

side cutting requires no starting holes... material may be started while ram is operating... new shearing principle eliminates resistance to feeding and turning the work... easy to operate, only 2 adjustments. Delivered completely tooled for all operations.



**WALES GIANT TRU-EDGE SHEAR**  
(Capacity up to 9/32" thick Mild Steel)



**WALES TRU-EDGE SHEAR**  
(Capacity up to 1/8" thick Mild Steel)

WRITE FOR CATALOG  
that fully illustrates and describes  
Wales Tru-Edge Shears

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**NORTH TONAWANDA, NEW YORK**  
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Wales-Strippit of Canada Ltd., Hamilton, Ontario  
Specialists in Punching and Notching Equipment



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### Plants in

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In the southland there's something new on the horizon . . . a mechanical cotton picker. It's quite a machine . . . picks two rows at once . . . handles acres and acres of cotton in nothing flat compared to slow, laborious hand-picking.

It's intriguing to watch this amazing machine. It has 2,560 *rotating steel fingers* that gently probe the open cotton bolls, and deftly pick out the soft, white cotton fibres.

A few years back when the new cotton picker was in the design and testing stage, the carbon steel fingers . . . all 2,560 of them came up for some serious attention. The heat treating *had* to be right. For the "fingers" had to be straight and they had to be hard. Just the right hardness . . . not *too* hard or they might snap off, and not too soft or they might bend.

Allis-Chalmers brought their problem to the metallurgical and heat treating research laboratories of Lindberg Steel Treating Co. In a short time, Lindberg heat treating specialists, in cooperation with Allis-Chalmers engineers, developed an effective and successful process. It permitted the heat treating of the carbon steel fingers without scaling . . . and without distortion . . . to precisely the right physical properties.

Solving problems in heat treating is an everyday experience for Lindberg Steel Treating Company. Some 34 metallurgical engineers and metallurgists with a composite heat treating experience of more than 650 years are available to consult with you on any heat treating problem. Your inquiry is invited.

A case history of Lindberg Steel Treating Co. service to American industry



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(JOHANSSON) and accessories. Short deliveries. Inspection and reconditioning service available at our plant

- **INTERNAL INDICATORS**

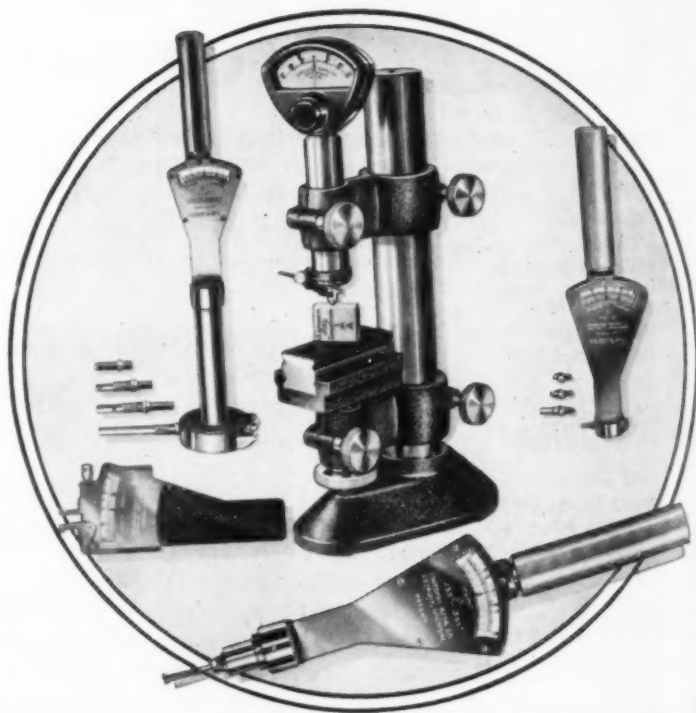
(or inside measurements. 155 to 24 inches)  
Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

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(Amplifier — for outside measurements)  
Graduations .0001 to .000002 or .001 M to .0002 M

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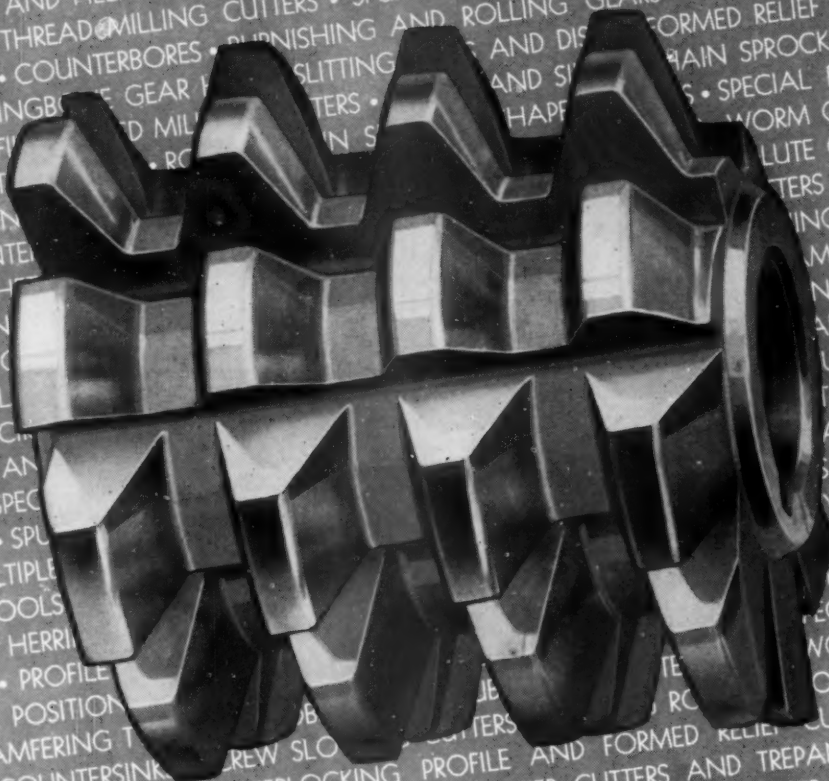
## C. E. JOHANSSON GAGE CO.

(A DIVISION OF SWEDISH GAGE CO.)

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# FOR THOSE TOUGH Special JOBS ... DEPEND ON National Tool Co.



● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

*Since 1905* engineers and manufacturers of high-quality special cutting tools for the metal-working industry

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Tools  
CLEVELAND  
**National**  
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*Pays off*

**IN FEWER REJECTS**



Types to fit any machine used for tapping or reaming.

You'll find that the Ziegler Tool Holder will pay for itself over and over again on tapping and reaming jobs because it practically eliminates the spoilage losses due to oversize and bell-mouthed holes which frequently result from the use of ordinary tool holders.

By automatically compensating for inaccuracies in aligning the work with the spindle, it enables the tool to turn out a perfect job, even though the work may be out of alignment with the spindle as much as 1/32" on the radius, or 1/16" on the diameter.

Get a Ziegler Holder and see how quickly your trouble with rejects will disappear.

**W. M. ZIEGLER TOOL COMPANY**

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for Taps and Reamers...

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*Standard Parts for*

**JIGS & FIXTURES**

*a size for every job*



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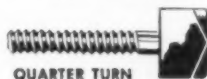
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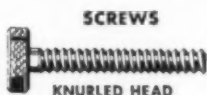
HAND KNOBS



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SWING C-WASHERS



C-WASHERS

*all sizes carried in stock*

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*Slashes Costs On Reaming Jobs*

## **Staples CARBIDE-TIPPED SHELL TYPE EXPANSION REAMER\***

Here's how you can triple your tool life on all types of line and piloted reaming jobs—use Staples Shell Type Expansion Reamers. To compensate for wear, reamer shell expands to original diameter by driving it up the tapered arbor. Re-expand shell until maximum carbide utility is reached. A new tool is obtained simply by replacing the worn shell—a standard item. Many design variations of this tool are possible, including use of two shells of different diameters for step reaming.

For maximum tool economy, specify Staples Carbide-Tipped Circular Tools for reaming, core drilling, spotfacing, counter-boring and end milling jobs. Quick delivery of standard tools from stock. Special tools designed to your requirements. Write for tool catalog.

\*Patented

**THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio**

Distributors in Major Cities

**Staples CARBIDE-TIPPED CUTTING TOOLS**

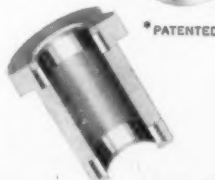
A complete line of Circular Carbide Tipped Cutting Tools  
Expansion Reamers — Special Tools

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## **INCREASE PRODUCTION.. SAVE TIME & MONEY ON YOUR DRILLING OPERATIONS**

**MEYCO**

**Carbide Inserted Bushings**  
last longer, cost less  
in the long run



For information and prices write for Meyco Bushing Catalog No. 13

Here is a bushing that combines the best features of steel and carbide: the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

☆

Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

**W. F. MEYERS CO., INC., BEDFORD, INDIANA**

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# Tool Steel Topics

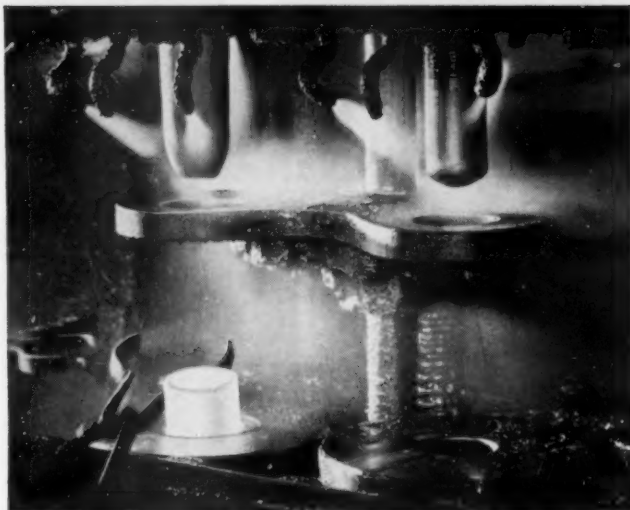
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation



**FOR 81 MM MORTARS**—Steel slugs, at left, are cut from 2½-in. round bars of carbon steel; next, the slugs are upset (center).

Heated to 2100 F, the upset slugs are extruded and formed into rough cups (right). The final product, not shown, is then cold-shaped to close tolerances.



**SCENE OF ACTION**—In this 1600-ton press, the upset slugs, heated to 2100 F, are cupped by the extruding punch at upper right. The forming die, at upper left, then shapes the cupped piece to more accurate shape. High-pressure jets of mixed air and water keep the punches and dies cooled to about 550 F. Punches and dies, made from Cr-Mo-W tool steel, are hardened and double-tempered to produce a hardness of Rockwell C-50.

## BETHLEHEM TOOL STEEL ENGINEER SAYS:



*Care is required when cutting tool steel with abrasive wheels.*

Cutting annealed tool steel with an abrasive cut-off wheel can cause both fine cracks and scorching on the surface unless certain precautions are observed.

Proper wheel speeds and the liberal use of coolant will help to avoid this sort of trouble. If these precautions are ignored, the excessive heat generated is often so intense that an annealed steel is actually hardened.

If the steel is heated above the critical range, the rapid conduction of heat to the adjacent cold steel serves as a quench. Hardnesses above Rockwell C-60 are often produced on surfaces which have been cut in this manner. Attempts to drill or machine such surfaces will result in trouble because the hardness is often high enough to make machining impossible.



An experienced spark-tester can identify the basic composition of this bar of tool steel. Can you?

## Slugs Formed Into Mortar Shells 500 an Hour, at 2100 F

Production men at the Ordnance Division of Rheem Mfg. Co., San Pablo, Calif., have good reason to be pleased with the long service life they've been getting from extrusion punches and forming dies made from our Chrome-Moly-Tungsten hot-work tool steel.

Hot slugs, to be processed into mortar shells, are extruded into a cupped shape by punches at the rate of 500 an hour. Because they are in such frequent contact with the slugs, heated to 2100 F, the temperature of the punches seldom falls below 550 F, even though the punches are sprayed with an air and water mixture.

The production men and tool designers at Rheem figured the punches would produce a maximum of 3,000 to 5,000 pieces before failure. Instead, one punch extruded 30,860 pieces; others produced 14,000 and 16,000.

The hot-forming dies, which form the cupped piece into more finished shape, are subjected to the same high temperatures. After forming 15,000 cups, one of these dies was polished and put back in service; it turned out another 63,000 pieces before it showed much wear.

Cr-Mo-W is an all-around hot-work steel containing 5 pct chromium. It's especially suited for jobs that involve both shock and repeated cycles of heating and drastic cooling. It's easy to machine and heat-treat; and it's highly resistant to heat-checking when water-cooled.

Cr-Mo-W hardens in air and distorts very, very little during heat-treatment. It's widely used for gripper and header dies, shear blades, trimmers, die-casting dies. Like to have more details? Write for Booklet 265. Address your request to Publications Dept., Bethlehem, Pa.

## KNOW YOUR SPARKS

The exact composition of a tool steel cannot be determined except by a laboratory analysis. However, the spark test is often convenient when bars of several different compositions become mixed.

Even amateurs sometimes use the spark test with good results by spot-grinding a bar of known analysis and comparing the spark stream with bars of unknown composition. A small-diameter grinding wheel, rotated at high speed to produce a generous flow of sparks, is recom-

mended for this test. Note the illustration.

Some elements such as carbon, tungsten or molybdenum have characteristic appearances in the spark stream. Other elements such as silicon and nickel modify the appearance of other elements.

Perhaps you are expert enough to recognize the sparks at the left. They indicate a steel having a fairly high carbon content (0.90 pct) and some tungsten (0.50 pct). It's our BTR, most popular of the general purpose, oil-hardening grades.



**Design**  
with a \$ sign—  
(for savings in initial cost)

the new **WALKER-TURNER**  
***LIGHT-HEAVYWEIGHTS***  
**Drill Presses**

This is an entirely new *class* of machines Walker-Turner has engineered. *Light-heavyweights*. For jobs where neither the capacity nor the expense of a large radial drill is warranted. Yet where the "hobby power tool" would be inadequate. In shipping and packing rooms, for example . . . in pattern and maintenance shops.

The new Walker-Turner Light-Heavyweight line gives industry the capacity for short-run production work, without the necessity of heavy investment. It's design with a dollar sign, representing money saved. Walker-Turner makes 15" and 20" Drill Presses (in Bench, Floor, and Production models), as well as Radial Drills. Send for complete information. Simply write name and address in margin below.

**WALKER-TURNER**

• **WALKER-TURNER** •  
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KEARNEY AND TRECKER CORPORATION  
PLAINFIELD, N. J.

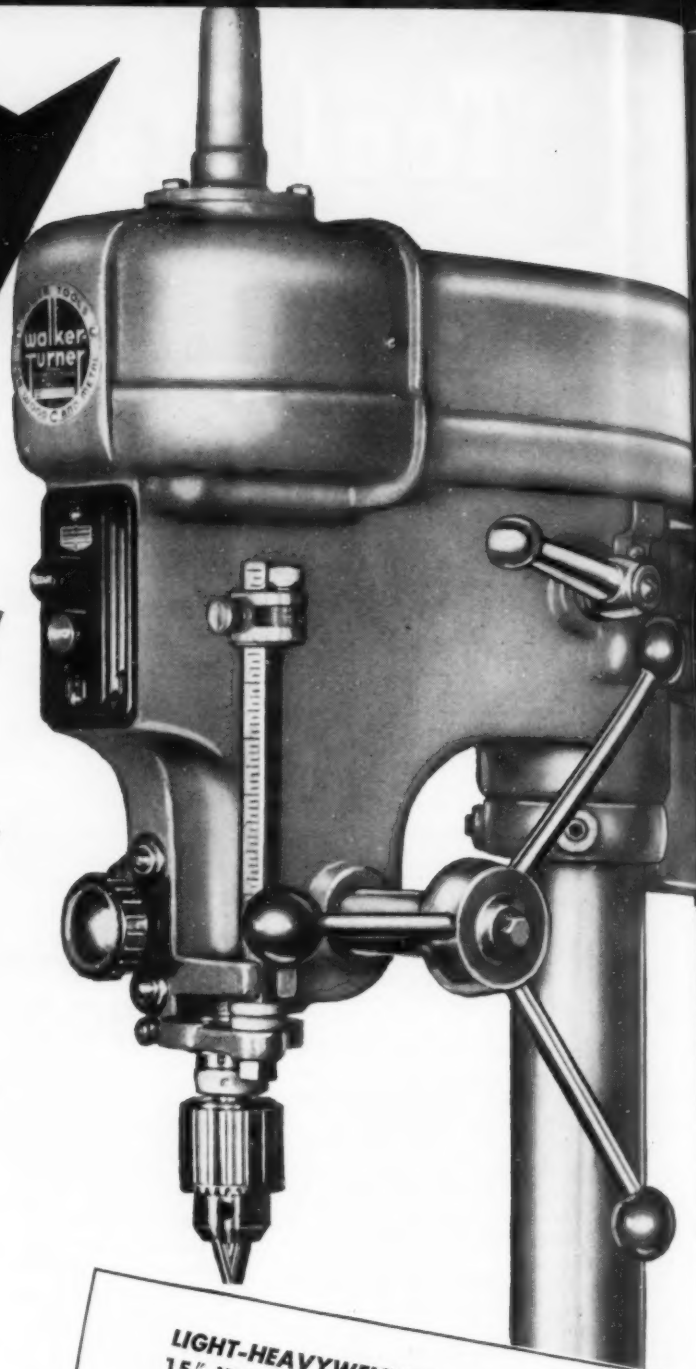
DRILL PRESSES—Hand and Power Feed • RADIAL DRILLS • Wood and Metal Cutting BAND SAWS • TILTING ARBOR SAWS • RADIAL SAWS  
JIG SAWS • LATHES • SPINDLE SHAPERS • JOINTERS • BELT and DISC SURFACERS • FLEXIBLE SHAFT MACHINES

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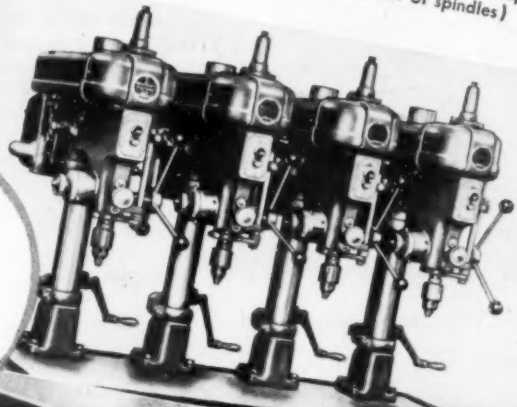
to write for full details and specifications.  
Walker-Turner Division, Kearney & Trecker Corp.  
Dept. TE-7, Plainfield, N. J.

(Please write your name and address in margin of page)



**LIGHT-HEAVYWEIGHTS "IN LINE"—  
15" WALKER-TURNER DRILL PRESSES  
PRODUCTION MODELS**

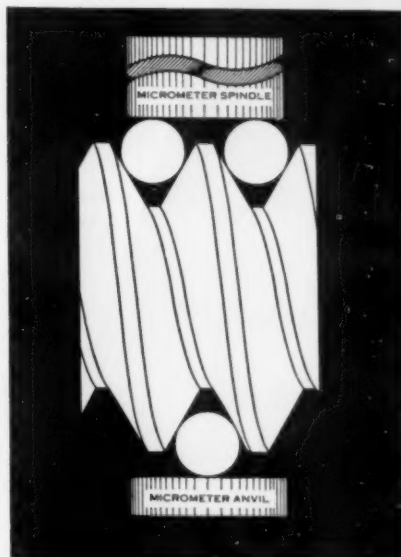
Designed for fast, accurate drilling at new low levels of investment and production costs. Features calibrated depth indicator. Capacity: 4 Spindle Production Model (shown)—18½" chuck to table, 7½" center of chuck to column. Six spline spindle mounted on 2 ball bearings. 4" and 6" travel. Four speeds—600, 1250, 2440 and 5000 r.p.m. with 1750 r.p.m. motor. Available in bench, floor, and multi-spindle models (from two to any desired number of spindles)



# TAP-ODDITIES



Pete went to a 3-D show  
Where things don't look the same.  
He put on his glasses just in time  
To be awfully glad he came!



Pete finds Bath Taps are true to scale  
By the 3-wire system measure.  
They give a Double Dollar Deal —  
(3-D's we all can treasure!)

Pitch diameter is a most important dimension of Bath Taps. The measurement made by the 3-wire system is an accurate method of standardization recommended for checking many taps.

To make this check, it is necessary that the micrometer touch all 3 wires (see illustration above). These wires should be selected of such a size that they are tangent to the thread angle at the mid-slope or point of intersection with the pitch line. Such a wire is called a "best" wire and a chart shows the proper sizes of "best" wires for each pitch.

For example — to determine the pitch diameter of a  $\frac{3}{8}$ "-16 NC tap, measuring .3885 over .03608 (the "best-size" wire for 16 threads per inch):

Actual measurement over wires	=	.3885
Subtract constant for "best-size" wire .03608	=	.0541
Pitch diameter of the tap	=	.3344

Bath "ground from the solid" Taps are "controlled" taps with measurements maintained to the closest tolerance. When the pitch diameter is known, subsequent lots of taps can be produced to exact size. Be sure of uniform results — use Bath Taps for Better Threads.



INSIST ON BATH TAPS  
— PROFIT BY THEIR  
PLUS—PERFORMANCE

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

# JOHN BATH CO. INCORPORATED

28 Grafton St., Worcester, Mass.

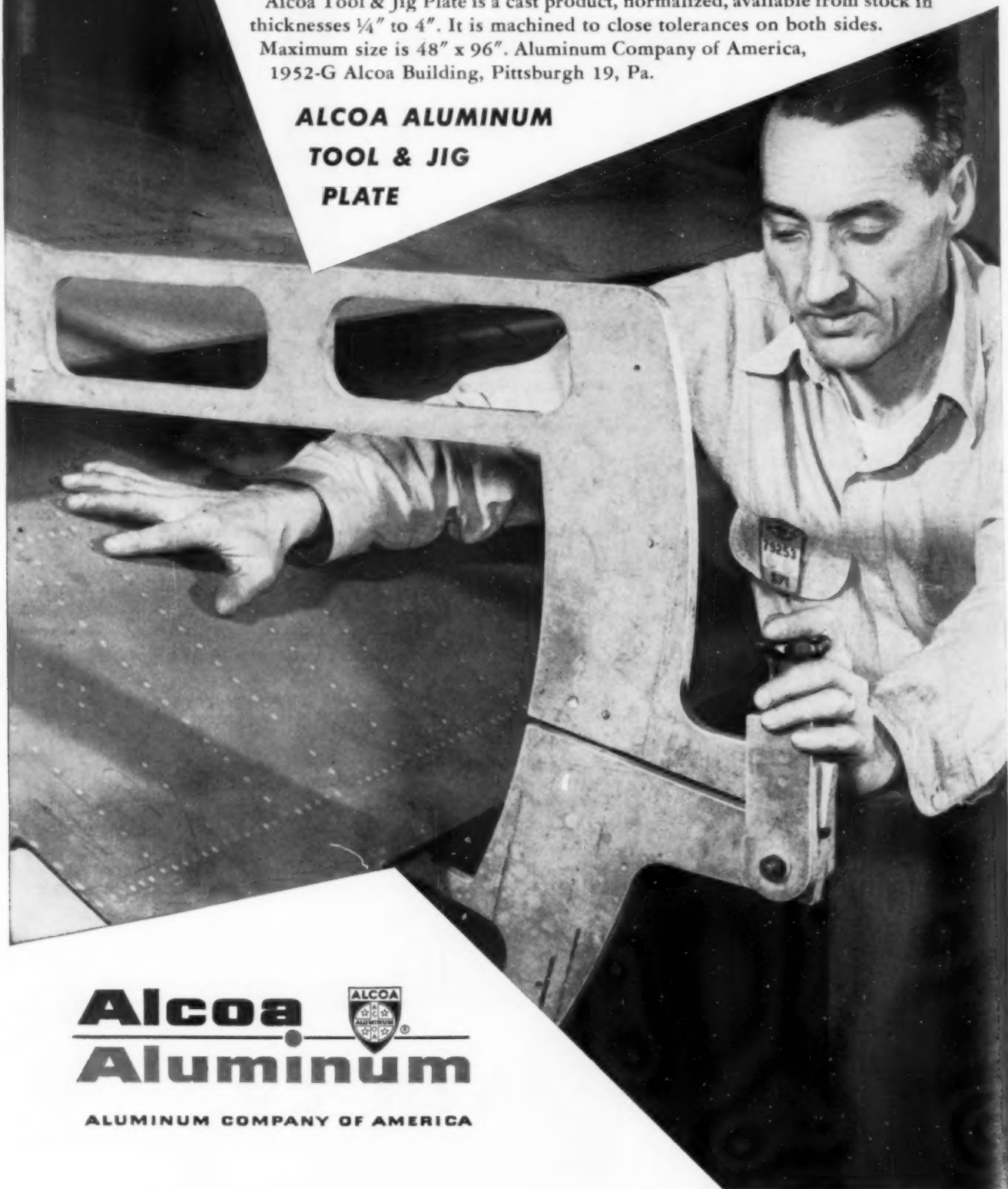
**This Jig is easy to handle** because it is made of aluminum (Alcoa Aluminum Tool & Jig Plate). It also costs substantially less than if it were made of steel because material costs are lower, and machining is faster.

Many manufacturers are using Alcoa Tool & Jig Plate for assembly and machining fixtures, dies for low-pressure molding of rubber and plastic, and dies for forming aluminum sheet.

Alcoa Tool & Jig Plate is a cast product, normalized, available from stock in thicknesses  $\frac{1}{4}$ " to 4". It is machined to close tolerances on both sides.

Maximum size is 48" x 96". Aluminum Company of America, 1952-G Alcoa Building, Pittsburgh 19, Pa.

**ALCOA ALUMINUM  
TOOL & JIG  
PLATE**



**Alcoa**   
**Aluminum**

ALUMINUM COMPANY OF AMERICA



Consider these

# **3 OUTSTANDING Advantages of** **SPRINGFIELD VERTICAL GRINDERS**

## **ALL SLIDEWAYS ABOVE GRINDING WHEEL**

protected from abrasive dust  
and grit . . . **LONGER LIFE.**

## **NO GRAVITATIONAL PULL**

to throw work out of line.  
Work sets solidly on vertical  
spindle . . . **GREATER ACCURACY.**

## **EASE OF OPERATION**

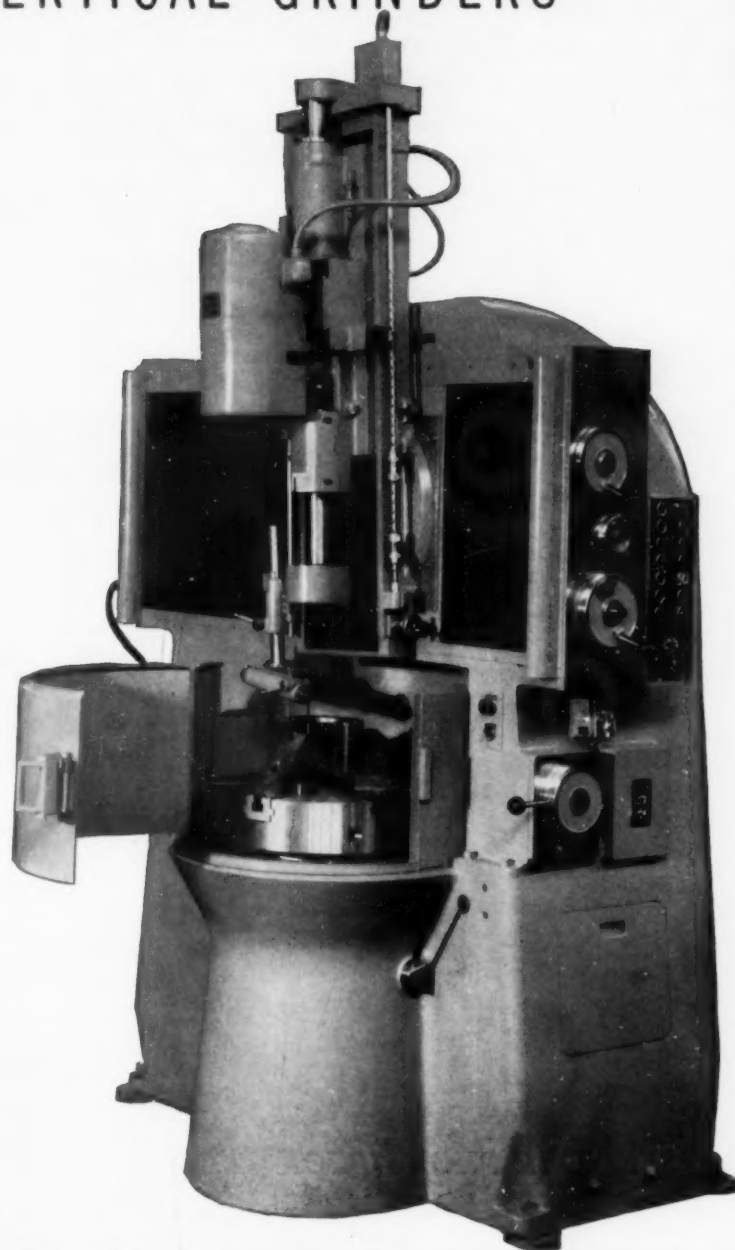
All controls conveniently located  
at normal height; greater  
work visibility; easier loading  
. . . **HIGHER PRODUCTION.**

## **PLUS the added advantage of GREATER VERSATILITY**

Grind combinations of O.D., I.D.,  
faces, tapers, shoulders or steps  
with one set-up. Hold extremely  
close related tolerances.

Springfield Vertical Grinders are thoroughly proved  
by 14 years of time-saving, cost-saving precision  
production. Various capacities to 42" swing x 24"  
hole depth.

*Write for Catalog 183*



## **THE SPRINGFIELD MACHINE TOOL COMPANY**

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6

**EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES**



## DO YOU NEED

**Surface Grinding to Gage Tolerance?**

**Dependable Grinding Performance  
in Production?**

**Positive Dust Protection?**

**... if so, Boyar-Schultz No. 6-12 is the  
Surface Grinder for YOU!**

It has the capacity to handle the biggest part of the tough assignments encountered in any shop. It has the accuracy to obtain the high precision needed in tool and gage making. In production it proves so sturdy that long runs, with accuracy, are no problem.

The New Dust Collector, made specially for No. 6-12 Surface Grinder is furnished as optional equipment and is built into the Grinder at the factory. With this Dust Collector, no more floor space is required.

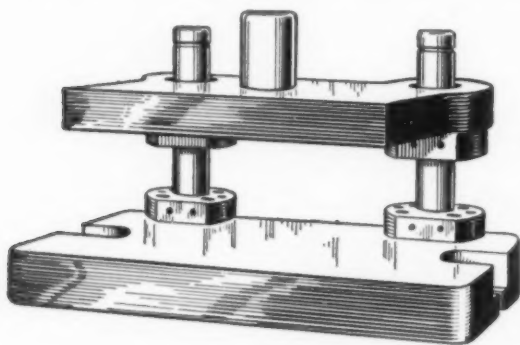
**BIG MACHINE PERFORMANCE—Small Machine Cost**



### BOYAR-SCHULTZ CORPORATION

2105 WALNUT STREET • CHICAGO 12  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-180-1

## BAUMBACH DIE SETS GET THERE FASTER!



— SEE YOUR PHONE BOOK  
FOR LOCAL DISTRIBUTOR —

**E. A. BAUMBACH MFG. CO.**

1812 SOUTH KILBOURN AVENUE  
CRawford 7-4041 CHICAGO 23, ILLINOIS

*The OLDEST Die Set Manufacturer*

*The NEWEST Die Set Design*

USE READER SERVICE CARD; INDICATE A-7-180-2

# Fellows

**MACHINES and TOOLS**

FOR CUTTING

... SHAVING

... BURNISHING

AND INSPECTION

**in GEAR PRODUCTION**

THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

USE READER SERVICE CARD; INDICATE A-7-180-3



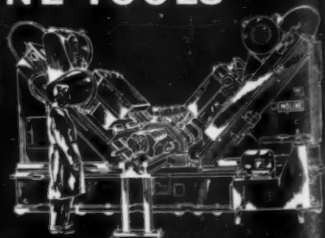
SINCE 1901

## MOLINE "Hole-Hog"

SPECIALY DESIGNED  
MACHINE TOOLS

have cut production  
costs for American  
Industry.

DRILLING • BORING  
HONING • TAPPING  
and Special Machines



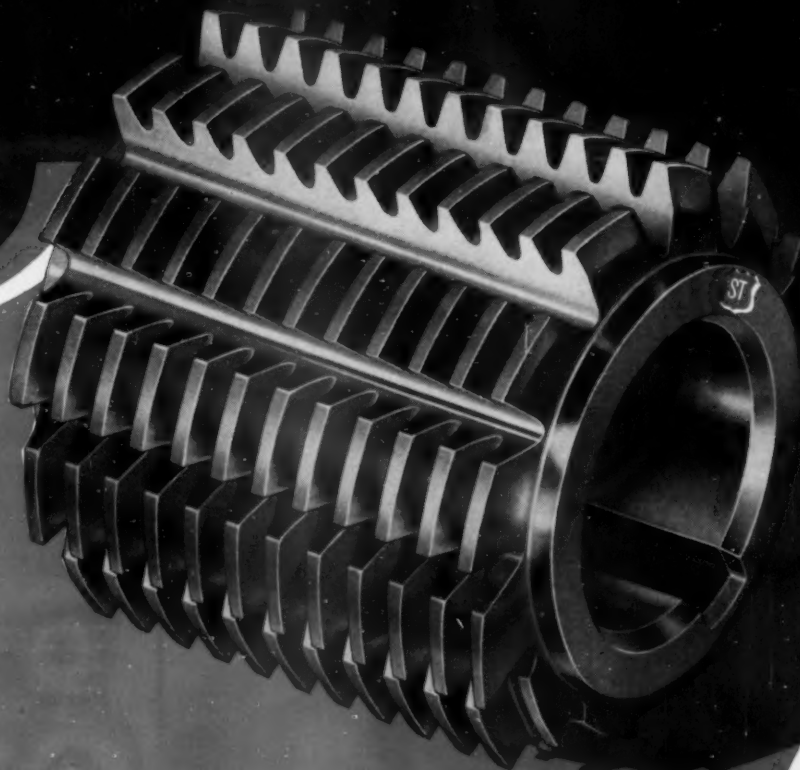
**Boring V-8 Engine Cylinders**

USE READER SERVICE CARD; INDICATE A-7-180-4



Red Shield says:

**"STANDARD for tough jobs  
since 1881"**



*as near as your telephone*



Call your Industrial Supply Distributor  
for Shield Brand Hobs. Specialized  
factory service available everywhere.

# STANDARD TOOL Co.

3950 CHESTER AVENUE

CLEVELAND 14, OHIO



NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

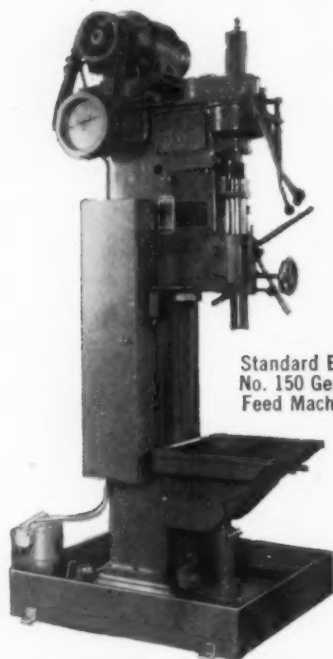
THE STANDARD LINE: *Twist Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*



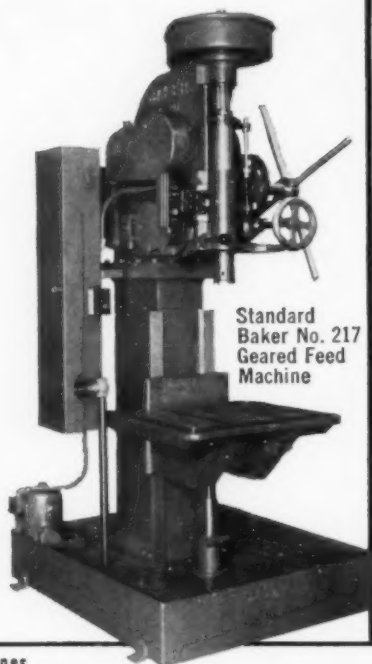
# BAKER

## Standard HEAVY-DUTY DRILLS

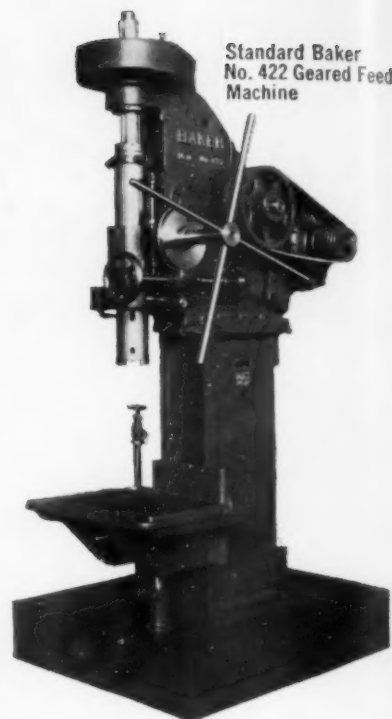
**2 to 4 WEEKS DELIVERY . . .**  
**ON THESE MACHINES—Subject to prior sale**



Standard Baker  
No. 150 Geared  
Feed Machine



Standard  
Baker No. 217  
Geared Feed  
Machine



Standard Baker  
No. 422 Geared Feed  
Machine



Standard  
Baker No. 321  
Geared Feed  
Machine

MAJOR SPECIFICATIONS—Single Purpose Types					
	150	150 Q.C.†	217	321	422
1. Capacity—Max. Dia. Drill in S.A.E. 1035 Steel	1½"	1½"	2"	3"	4½"
2. Max. H. P. Motor used.....	7½"	7½"	10"	15"	20"
3. Distance center of Spindle to Frame [Gap]*....	11"	11"	12¼"	12¼"	12¼"
4. Maximum Spindle Travel.....	11"	11"	12"	16"	16"
5. Spindle—Outside Dia. splined driving end.....	1¾"	1¾"	2"	2-13/16"	3¼"
6. Dia. of Spindle Sleeve.....	2¾"	2.750"	3¼"	4¼"	5¼"
7. Dia. of Spindle Nose.....	2.975	2.975"	.3225	4.225"	5.225"
8. Morse Taper in Spindle as standard.....	No. 4	No. 4	No. 5	No. 5	No. 6
9. Standard Speed Range in R.P.M.....	151-632	48-1120	76-614	27-220	20-165

\* Can be increased 3" by use of offset Spacer Block. † Quick Change, 12 Speeds

Baker Brothers, Inc.  
Toledo, Ohio

Gentlemen:

Please send more information on Baker Standard  
Drills to:

NAME.....

COMPANY.....

STREET.....

CITY.....STATE.....

Baker single purpose type drills are heavy duty . . . provide a wide range of speeds and feeds for Single and Multiple Spindle Drilling . . . Reaming . . . Boring . . . Facing . . . Chamfering . . . Undercutting and Tapping Operations. Write for full details.

**BAKER BROTHERS, INC. Toledo, Ohio**  
DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

# Maintenance report from user of 13 Rotor Grinders:

"after 14 months  
**COST \$0.00**"



**T**HIS large manufacturer of electrical equipment has been using 13 Rotor B-35 Vertical Air Grinders for 14 months—two shifts per day, 6 days per week—for sanding, wire brushing and grinding. They report that not one cent has been spent for maintenance—no time out for repairs! And metal removal has been far greater than with other types of grinders . . . and their good balance make them popular with operators.

If you haven't seen these new Rotor Vertical Grinders in action, ask for demonstration today!

**AIR O'TOOL**

## ROTOR VERTICAL SPECIFICATIONS

	B-35	B-12
Weight	10¾ lbs.	10 lbs.
Wheel Size	6" Cup	6" Cup
Pad Size	7" or 9"	7" or 9"
Speeds	6000, 5000, 4500, 3500	6000, 5000, 4500, 3500
Height	7½"	7"

For cup wheels, sanding pads, cut off wheels, wire brushing.

**WRITE TODAY FOR BULLETIN No. 40**



**THE ROTOR TOOL CO.**  
CLEVELAND, OHIO

**UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS**



# Warner & Swasey 5-Spindle Automatic pays for itself in one year's operation!

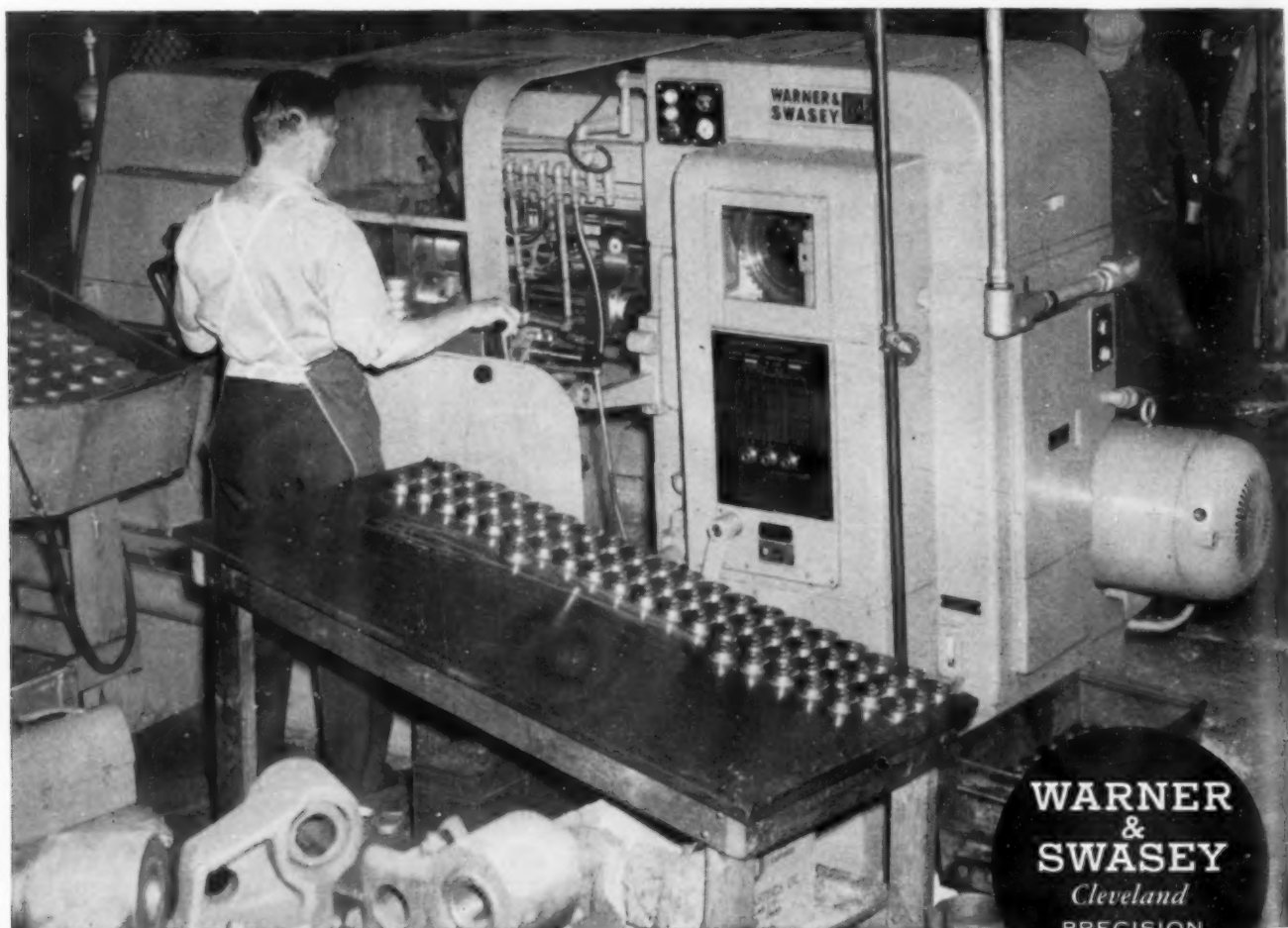
**T**HIS STORY comes from the production-minded Eureka-Williams Corporation of Bloomington, Ill. Shooting for greater production, they installed a Warner & Swasey 5-Spindle Automatic Chucking Machine to machine the cast iron valve discs used in their oil burners.

The first month's production records showed the machine had more than lived up to expectations. During the month, the machine turned out as many parts as seven hand-operated machines! And it reduced the machining cost on the parts 45%. Records for subsequent months showed even increased savings—and that the machine

actually paid for itself in the first year's operation!

Eureka-Williams has found that the 5-Spindle Automatic is quick and easy to set up, that operators like the machine, that it has provided them the dependable, high precision operation you can expect from any Warner & Swasey.

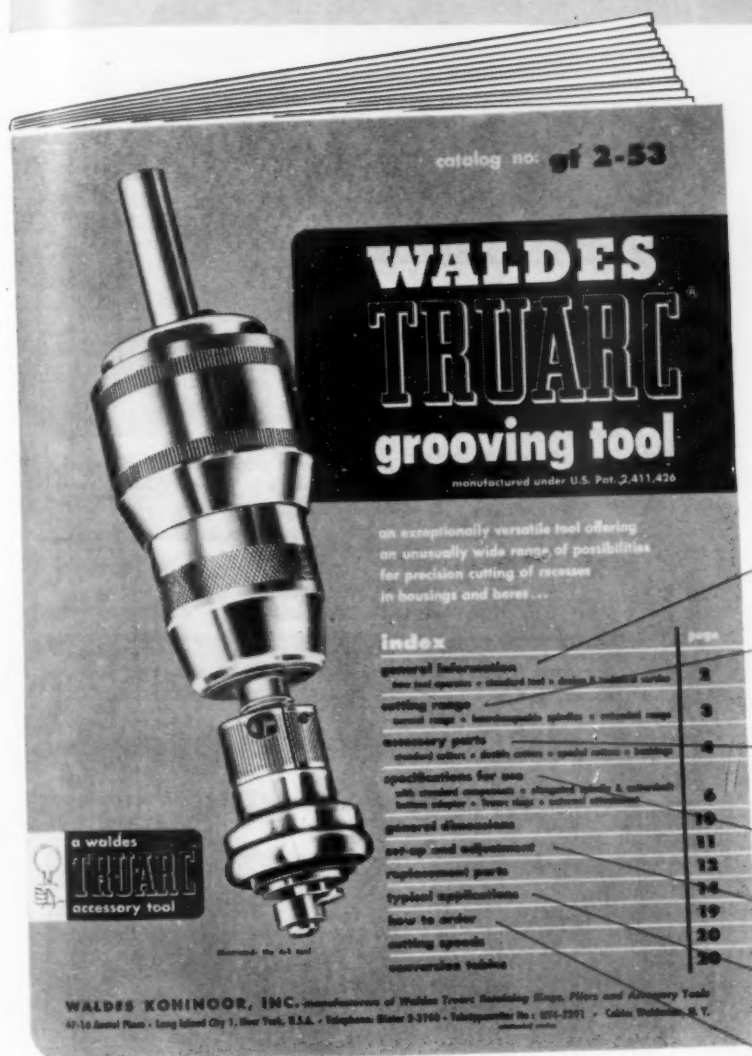
Certain jobs in your shop—even small and medium lot runs—can undoubtedly be machined faster, more uniformly, and at lower cost on Warner & Swasey Automatics. Your nearest Warner & Swasey Field Representative will be glad to show you exactly how an automatic can improve *your* operations.



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY



# Now, a complete new 20-page catalog for the Waldes Truarc Grooving Tool



### ... the One Versatile Tool Designed for High Speed, Precision Cutting of Internal Grooves in Housings and Bores

Here is the most complete catalog ever published—on the cutting of internal concentric recesses. Complete with descriptive, illustrated information and data charts showing how the Waldes Truarc Grooving Tool can solve virtually every internal grooving problem you may have. Shows how even *unskilled labor* can perform precise, production-line operations.

Facts and figures on the Waldes Truarc Grooving Tool . . . its special features, modifications and adaptations.

Data showing how the Waldes Grooving Tool cuts accurate grooves in housings with diameters from .250 to 5.000 inches.

Charts describing various cutters: single, multiple, beveled and special profiles. Description of bottom adaptors, elongated spindles, and extended bushings . . . for solving particular problems.

Location of grooves under varying conditions: in bores, housings, and blind holes.

Diagrams and easy-to-follow instructions on the set-up of the Grooving Tool.

5 full pages showing 17 case histories covering the range of typical problems and solutions.

Complete information on how to select the right model tool . . . and the right accessories . . . for your particular job.

WRITE NOW FOR THIS NEW 20-PAGE CATALOG



MADE BY THE MANUFACTURERS OF WALDES TRUARC RETAINING RINGS.

WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N. Y.

Waldes Truarc Grooving Tool manufactured under U.S. Pat. 2,411,426

Waldes Kohinoor, Inc., 47-16 Austel Place  
Long Island City 1, New York

Please send me your new 20-page Catalog on  
the Waldes Truarc Internal Grooving Tool.

Name \_\_\_\_\_

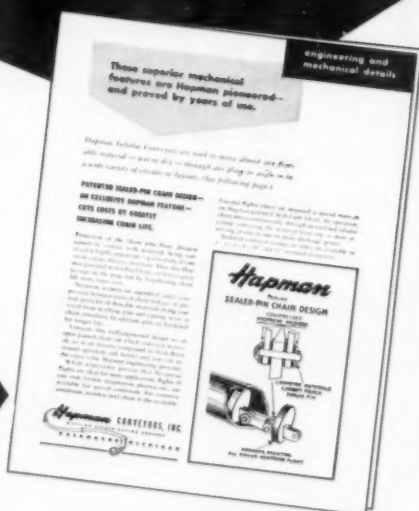
Title \_\_\_\_\_

Company \_\_\_\_\_

Business Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

**Get your  
copy of  
this new  
Bulletin**



Among them are long-lived Sealed-Pin Chain (patented), All-Round Neoprene Flights, Roller Turns for special conditions, and other superior mechanical advantages.

**WRITE FOR NEW  
BULLETIN TE-753**

Below: Illustration from new bulletin shows conveyor discharging metal chips into tote box.



**Hapman CONVEYORS, INC.**  
DIVISION HAPMAN-DUTTON COMPANY  
KALAMAZOO MICHIGAN

USE READER SERVICE CARD; INDICATE A-7-186-1

Available in groups of 3, 5 and 8 specimens. Low cost. Write for details, now!

**ACME**  
**INDUSTRIAL**  
**COMPANY**

208 N. Laflin St.  
Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR OVER A QUARTER CENTURY  
USE READER SERVICE CARD: INDICATE A-7-186-2

**Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.**

**BLACK DRILL COMPANY, INC.**  
1414 East 222nd St. • Cleveland 17, Ohio

**Also makers of—  
BLACK DRILLING  
UNITS—AUTOMATIC,  
SELF-CONTAINED—  
FOR COST-CUTTING  
PRODUCTION ON  
ALL MATERIALS**

**Write for information**

USE READER SERVICE CARD: INDICATE A-7-186-3

PARKER • MAJESTIC



PRECISION MACHINES



*Pictured here is the home and products of*  
**PARKER-MAJESTIC, INC.**

For almost a quarter of a century this company has manufactured the Parker Spindles used in Precision Grinding, Boring and Milling applications. Additional products include the well known line of Parker-Majestic Internal, External, No. 2 Surface and Rotary Surface Grinders.

*Descriptive literature upon request.*



**PARKER-MAJESTIC, INC.**

formerly MAJESTIC TOOL & MFG. CO.

147 JOS. CAMPAU

• DETROIT 7, MICHIGAN



**WHY  
YOU  
GET**

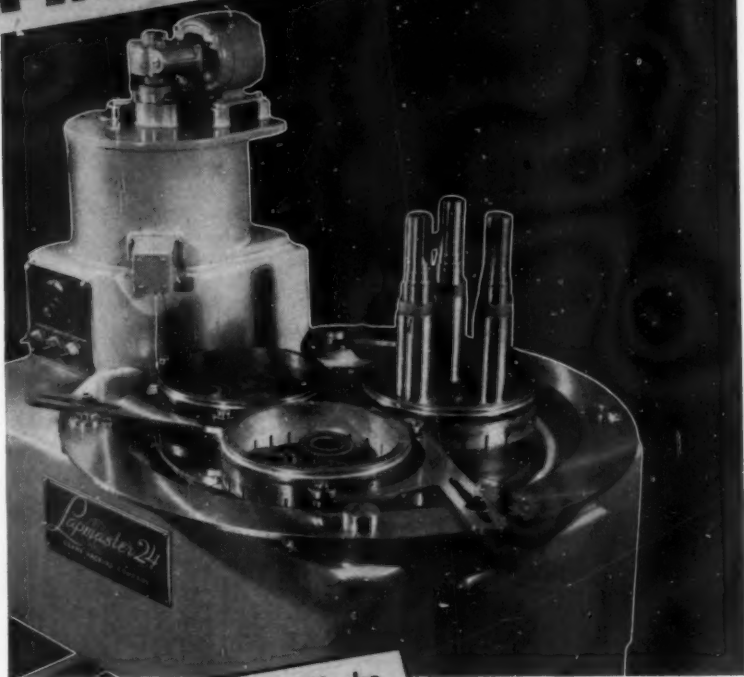
*Precision Flatness,  
Finish and Parallelity  
in Production Quantities...*

## **WITH A LAPMASTER**

Here is the machine to do the job if you want precision flatness in production quantities at an economical rate. Lapmaster machines readily lap to the extreme close tolerance of one light band (0000116") or less. In addition, they produce an extremely fine finish to as low as 1 RMS.

Check these features and investigate the possibilities for the Lapmaster in your plant.

1. Operator requires no previous lapping experience.
2. Automatic timer provides controlled lapping cycle for production efficiency and allows time for pre-loading work-holders.
3. Simplicity of design allows ease of loading and unloading.
4. Loose abrasive distributed evenly over lapping area insures uniform results.
5. Serrated lap plate collects and disposes of spent compound and removed stock.
6. Precision laps identical parts or parts of various shapes, heights and materials in one cycle.
7. Self-conditioning lap plate eliminates down time for truing or replacement.



### **How the Lapmaster Works**

The work being lapped causes wear on heavy cast iron lap plate.

As the work is wearing the lap, the conditioning rings are continually conditioning the lapping plate surface.

Since the wear action of the conditioning rings is greater than the wear caused by the work being lapped, the flatness of the lap plate is automatically maintained.

### **FREE DATA**



Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

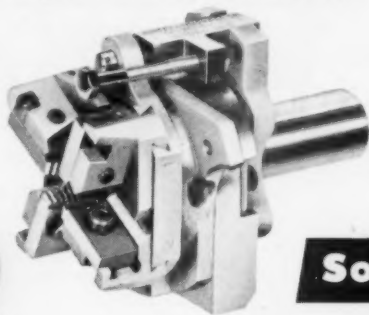
**JOHN CRANE**

Crane Packing Company, Dept. TE-7, 1823 Belle Plains Avenue, Chicago 13, Illinois

# **CRANE PACKING COMPANY**

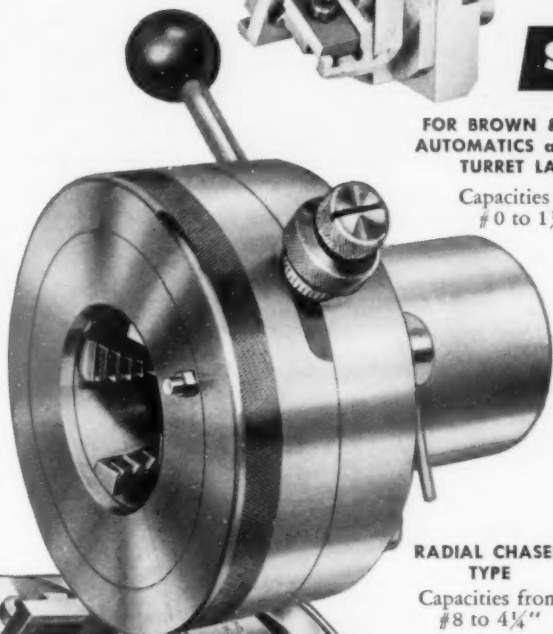
# JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J & L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.



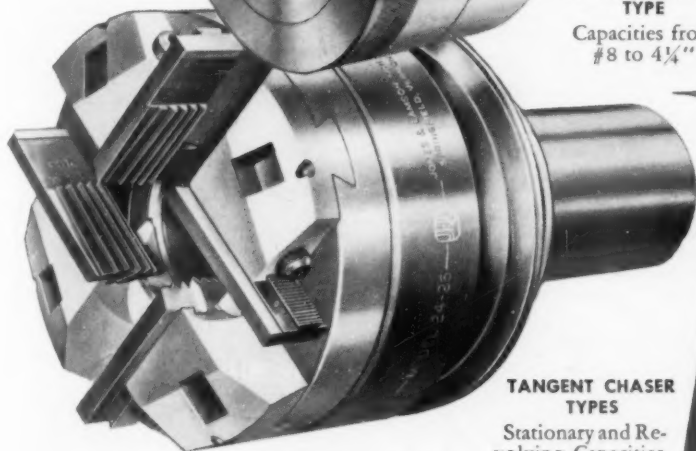
FOR BROWN & SHARPE  
AUTOMATICS and SMALL  
TURRET LATHES

Capacities from  
#0 to 1 1/4"



RADIAL CHASER  
TYPE

Capacities from  
#8 to 4 1/4"



TANGENT CHASER  
TYPES

Stationary and Re-  
volving. Capacities  
from #4 to 2"

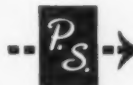
## Some of the reasons why:

**COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS.** J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

**THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING.**

This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

**EASY, CONTROLLED RESHARPENING.** J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.



Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.

# JONES & LAMSON

Machine Tool Craftsmen  
Since 1835

JONES & LAMSON MACHINE CO., 518 Clinton St., Dept. 710, Springfield, Vt., U.S.A.



DIE HEAD DIVISION

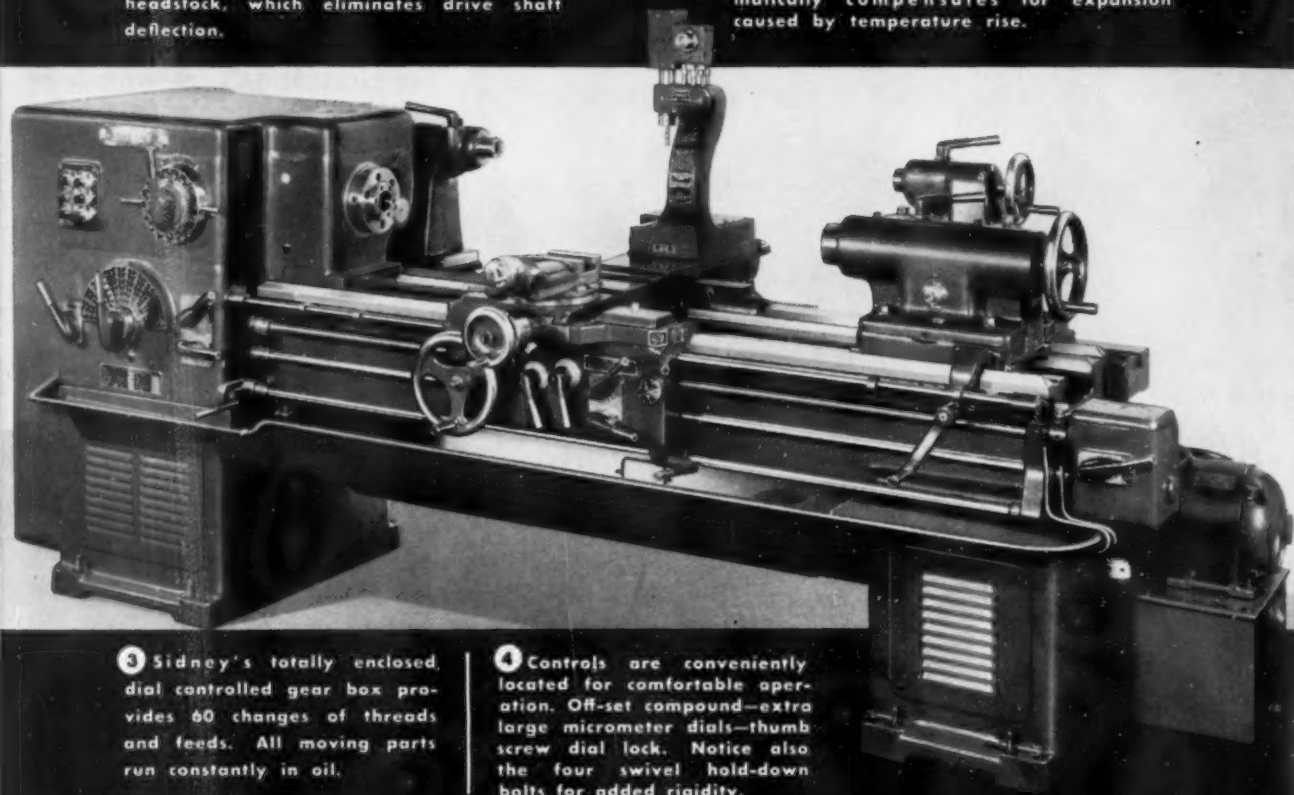
A LOOK TO SIDNEY  
IS A LOOK IN THE  
RIGHT DIRECTION

FOR  
INCREASED PRODUCTION  
AND  
LOWER COSTS

## WHY? — Because here are the points of superiority of **SIDNEY HEAVY-DUTY LATHES**

① Change gears rotate on anti-friction bearings and are mounted on fixed centers. Driving sheave is mounted on pre-loaded anti-friction bearings and is full floating on sleeve bolted to back of headstock, which eliminates drive shaft deflection.

② All-herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.



③ Sidney's totally enclosed, dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

④ Controls are conveniently located for comfortable operation. Off-set compound—extra large micrometer dials—thumb screw dial lock. Notice also the four swivel hold-down bolts for added rigidity.

⑤ Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.

WRITE FOR BULLETINS

**SIDNEY FLUID TRACER LATHES** furnish greater versatility, wider range of work, unlimited reproduction true to form in every detail.

**THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO**  
*Builders of Precision Machinery since 1904*



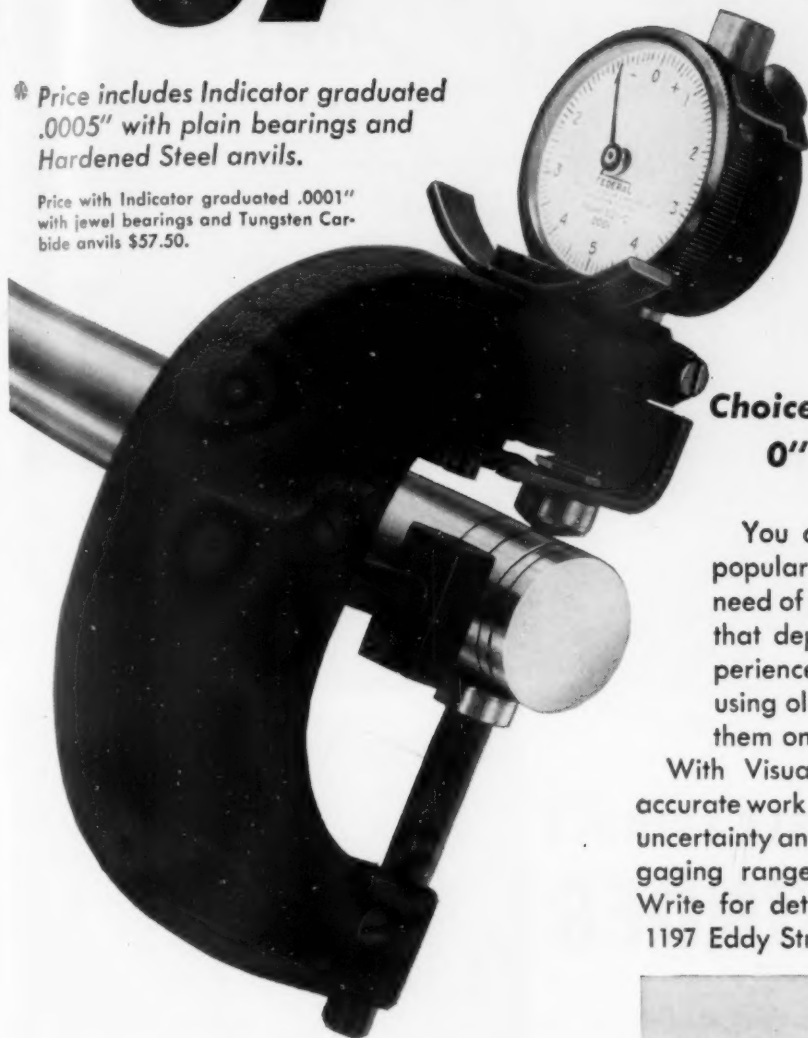
# \$37<sup>50</sup>\*

## buys this

# Indicating SNAP GAGE

\* Price includes Indicator graduated .0005" with plain bearings and Hardened Steel anvils.

Price with Indicator graduated .0001" with jewel bearings and Tungsten Carbide anvils \$57.50.



Choice of 3 capacities:

0" to 1",  $\frac{3}{4}$ " to 2",  $1\frac{3}{4}$ " to  $3\frac{1}{4}$ "

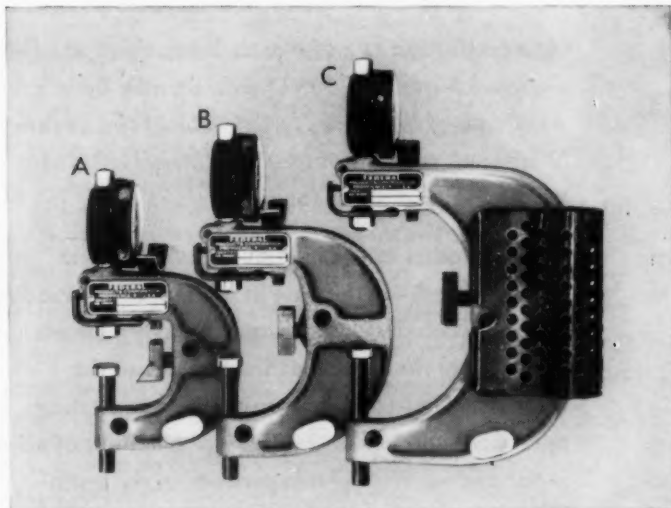
You can't afford to be without the most popular modern Indicating Snap Gage. No need of hanging onto antiquated snap gages that depend on blind, uncertain "feel". Experience proves you aren't saving money using old style gages just because you've got them on hand.

With Visual Indicating Gages you get more accurate work with less scrap. They relieve operator uncertainty and frustration. And, they cover a wider gaging range. Larger sizes are available, too. Write for details. Federal Products Corporation, 1197 Eddy Street, Providence 1, R. I.

Set of 3 Gages covers all sizes from 0" to  $3\frac{1}{4}$ "—replaces rackfuls of old style gages.

- A Model 1000P-1—A  
Capacity 0" to 1"
- B Model 1000P-2—A  
Capacity  $\frac{3}{4}$ " to 2"
- C Model 1000P-3—A  
Capacity  $1\frac{3}{4}$ " to  $3\frac{1}{4}$ "

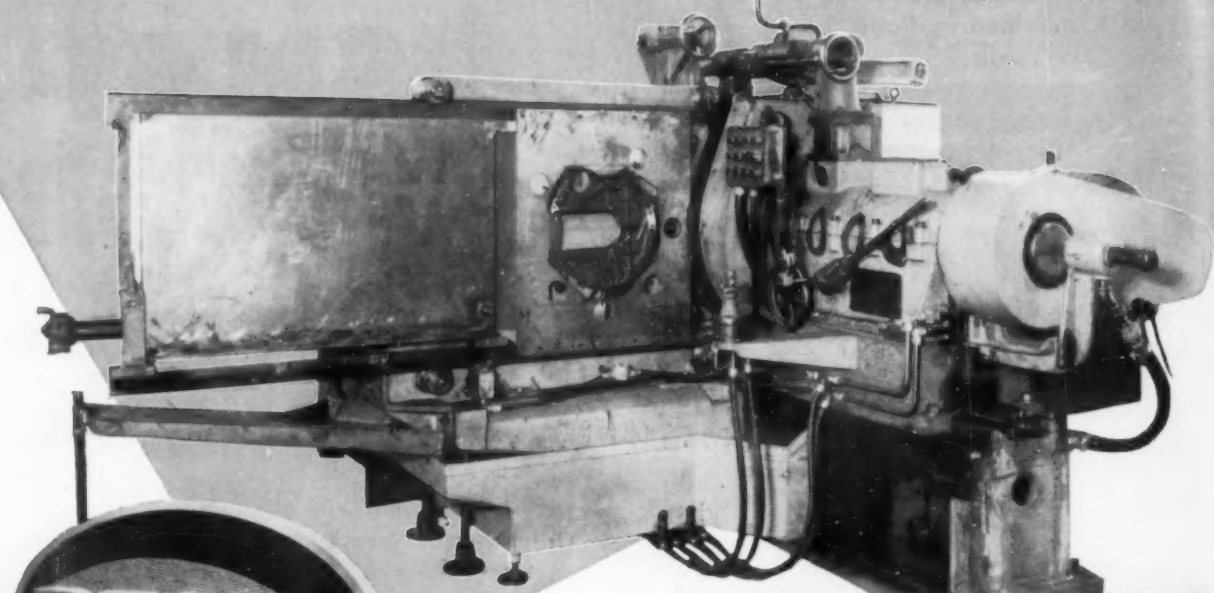
Larger sizes available.



# FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing all types of DIMENSIONAL INDICATING GAGES

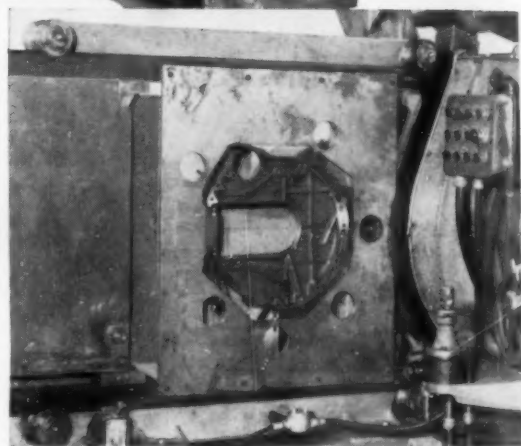
# IT GRINDS **TWO** SURFACES For the Price of One!



## DOUBLE SPINDLE GRINDER

At a production rate of one a minute, this specially designed Model 226-30" Double Spindle Besly grinds *both sides of torque converter plates at the same time.* With stock removal of .020", accuracy is .003" for parallelism and .006" for size.

This is another example of how Besly grinders are paying off—in this case in higher production for a leading automobile manufacturer. Besly's success in matching the right machine design and the right abrasive to each of many different grinding operations and metals, including the hardest of alloys, is due to over fifty years experience in the grind-field. Our engineers are at your service.



### *Tailored to Fit the Job . . .*

Special jig which holds torque converter plate castings is fed between abrasive discs by long hydraulic piston and cylinder, and oscillated for faster production and greater accuracy. Oscillating movement of jig on slide is controlled by a system of limit switches, timers and solenoid valves. Hydraulic feed of the abrasive discs against the casting is limited by a pre-determined stop. Coolant is supplied to the work through the center of the spindles.



## **BESLY-WELLES** CORPORATION

Established as CHARLES H. BESLY and CO. in 1875  
118 Dearborn Avenue, Beloit, Wisconsin

BESLY GRINDERS and ACCESSORIES  
BESLY TAPS, DRILLS, REAMERS, END MILLS  
BESLY-TITAN ABRASIVE WHEELS



**This new booklet shows you  
how Kodak Contour Projectors can simplify  
your inspection and measurement problems**

Just off the press is the most informative booklet on Kodak Contour Projectors we've ever published.

- It shows by example and case history how you can inspect large parts, small parts, long parts, curved parts, delicate parts, complex parts, all sorts of parts on the Kodak Contour Projector.
- It gives details of both the Model 2A for precision micrometry, and the Model 3 for fast, routine gaging.
- It describes the features that make Kodak Contour Projectors adaptable to such a wide variety of work.
- It lists the accessories that extend their versatility.
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EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

**the KODAK CONTOUR PROJECTOR**



A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

**Kodak**



# Beaver BLADE-SETTING AND INSPECTION FIXTURES GIVE FASTER, MORE ACCURATE JOBS... CUT COSTS IN HALF!



Adjustable setting-post assembly, (No. F-2861-A), instantly and accurately positions each blade.



This is an F-2861-B fixture with No. 50 NMTB taper spindle and adaptor, equipped with setting-post assembly.



A convenient spindle-lock located on the right side of the spindle, holds the work in any desired position.

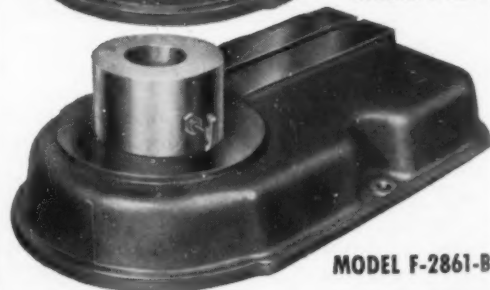


Accurate and frictionless spindle takes any tool with No. 50 NMTB taper shank or any style cutter with No. 50 NMTB adaptor.

BEAVER blade-setting fixtures take ALL the guesswork out of blade resetting. These fixtures are also ideal for checking the accuracy of any type cutter or tool after grinding. With the aid of a Beaver blade-setting fixture, the grinding and resetting operation takes about one-half the usual time required. Anyone familiar with milling cutters can do an expert job without long experience. Available in two types—No. F-2213 with solid spindle and adaptor bushings or No. F-2861-B with 50 NMTB Taper spindle mounted in precision, anti-friction bearings.



MODEL F-2213



MODEL F-2861-B

See our Catalog 52 for cost-reducing Beaver Tools

## Beaver

## TOOL AND ENGINEERING CORPORATION

2850 ROCHESTER ROAD • BOX 429, ROYAL OAK, MICH., Teletype - Big Beaver 648



# We've put a new roof over an old part of our business

► **Now—with new, expanded facilities**  
—we can offer you immediate help with  
your unusual metalworking problems,  
big or small

**T**HOUGH we've been designing and building standard and special machine tools and tooling since 1898, limited production facilities for special machines have prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or to specially adapt standard equipment to solve specific metalworking problems.

## Check our qualifications:

**EXPERIENCE:** We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our annual production of special machinery has ranged up to \$3,000,000.*

**FACILITIES:** The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than \$2,500,000 worth of new tools and equipment.

**PERSONNEL:** The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields to metalworking. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

**PERFORMANCE:** Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These solutions required provision of high productive capacity as well as exacting dimensional accuracies and surface finishes.

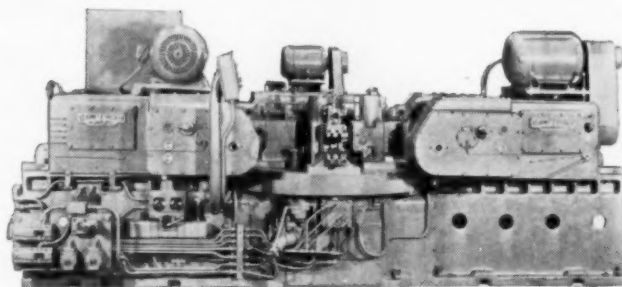
**RESPONSIBILITY:** Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this Division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

## We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a four-station rotary indexing machine we designed and built for a major automotive manufacturer.



# FOOTBURT

line of  
production  
machines...

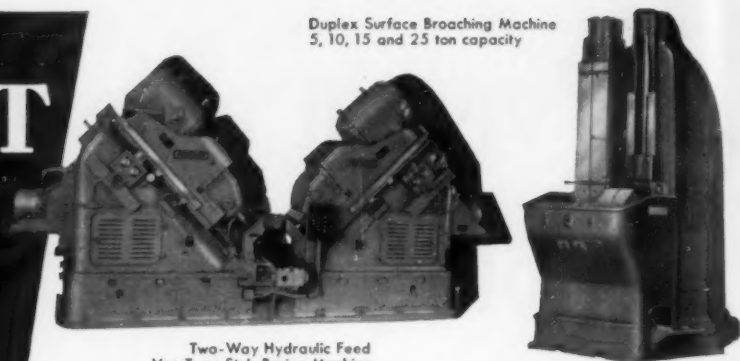
● Way Type Drilling, Boring, Reaming, Tapping and Milling Machines with One, Two or More Ways . . . Station Type Machines . . . Center Column Type Machines . . . Cylinder Boring Machines . . . Inverted Drilling Machines . . . Surface Broaching Machines . . . Sensitive Drilling Machines . . . Hammond Radial Drilling Machines . . . Manufacturing Type High Duty Drilling Machines . . . Independent Feed Drilling Machines . . . Special Machines.

**THE FOOTE-BURT COMPANY, Cleveland 8, Ohio**

Detroit Office: General Motors Building



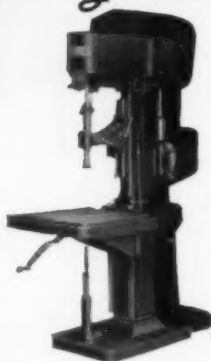
Five Way 21 Spindle Lead  
Screw Tapping Machine



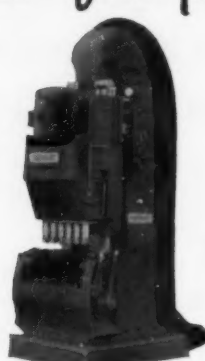
Duplex Surface Broaching Machine  
5, 10, 15 and 25 ton capacity

Two-Way Hydraulic Feed  
Vee Type Stub Boring Machine

*engineered for production*



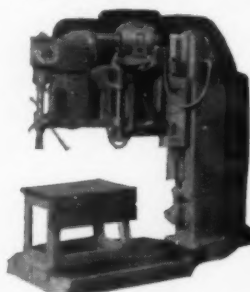
1, 2, 3, 4 and 6 Spindle  
Sensitive Drilling Machines



Stub Type Cylinder  
Boring Machines



Single Slide and Broaching  
Machine 5, 10, 15 and 25 Ton  
capacity



Unique Bracket Type Hammond  
Radial Drilling and Tapping  
Machine



Continuous Type  
Broaching Machine  
Built in Four Sizes



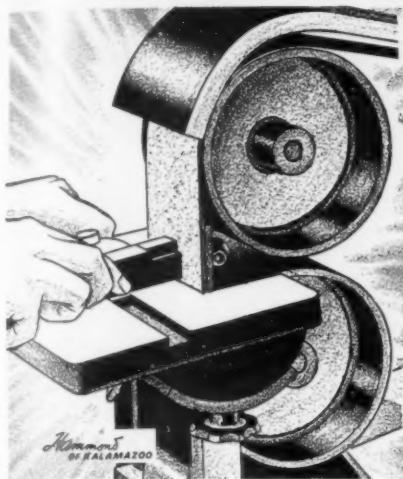
17 Station, 104 Spindle, Unit  
Type, Drilling & Tapping Machine

# FOOTBURT

**PRODUCTION MACHINE TOOLS**



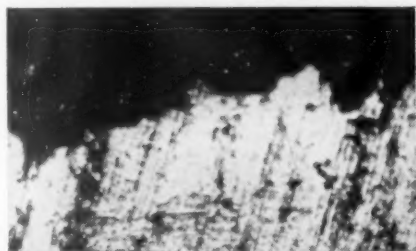
# NEW 3M DISCOVERY obsoletes all other abrasive belt methods for sharpening carbide tools!



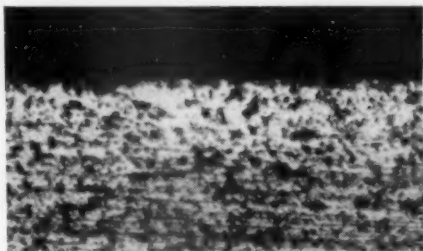
Here is a completely new machine—a completely new method—for belt sharpening tungsten carbide tools. Gives a longer-lasting, more precise edge than ever before possible without diamond wheels and highly skilled operators. Developed by 3M, designed and built by Hammond Machinery Builders, this machine uses a specially designed 3M Abrasive Belt passing over an absolutely flat carbide platen. This special work surface—hard as the tools you finish—enables you to finish every cutting surface. That means you can finish the all-important *top* of the tool, impossible with previous belt methods. All lands are restored to original *flat* planes—not hollow-ground.

Look! Micro-photographs\* prove new 3M Carbide Tool Sharpening Method gives a better finish than ever before possible except on a diamond wheel!

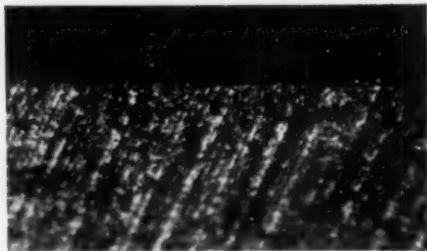
\*These photos, representing 1/100 of an inch, show the cutting edge of a single point tungsten carbide tool.



Grinding with green grit silicon carbide wheels leaves this rough jagged edge leading to premature breakdown of cutting edge—result short tool life, frequent reshaping, costly set-ups and loss of production efficiency.



Finished with 150 grit "Tri-M-ite" Resin-ite Paper Belt, after rough grinding with a 60 grit green wheel, gives this near-perfect edge. Even an unskilled operator can attain results like this! Compare this picture with the one at right...



... finished with 180 grit diamond wheel. Here is perfection—on a brand-new tool! These micro-photographs show the slight difference between the 3M-sharpened tool and this diamond-sharpened tool! Here is conclusive proof that the 3M Carbide Tool Sharpening Method comes as near perfection as it is possible to get—at only a few cents per belt!

GET ALL THE FACTS FROM YOUR 3M REPRESENTATIVE about this amazing new method for sharpening carbide tools. He will be glad to give you full details!



MINNESOTA MINING & MFG. CO., Dept. TE-73, St. Paul, 6, Minn.

Yes! I want to talk to a 3M Representative about the new 3M Carbide Tool Sharpening Method!

Name

Company

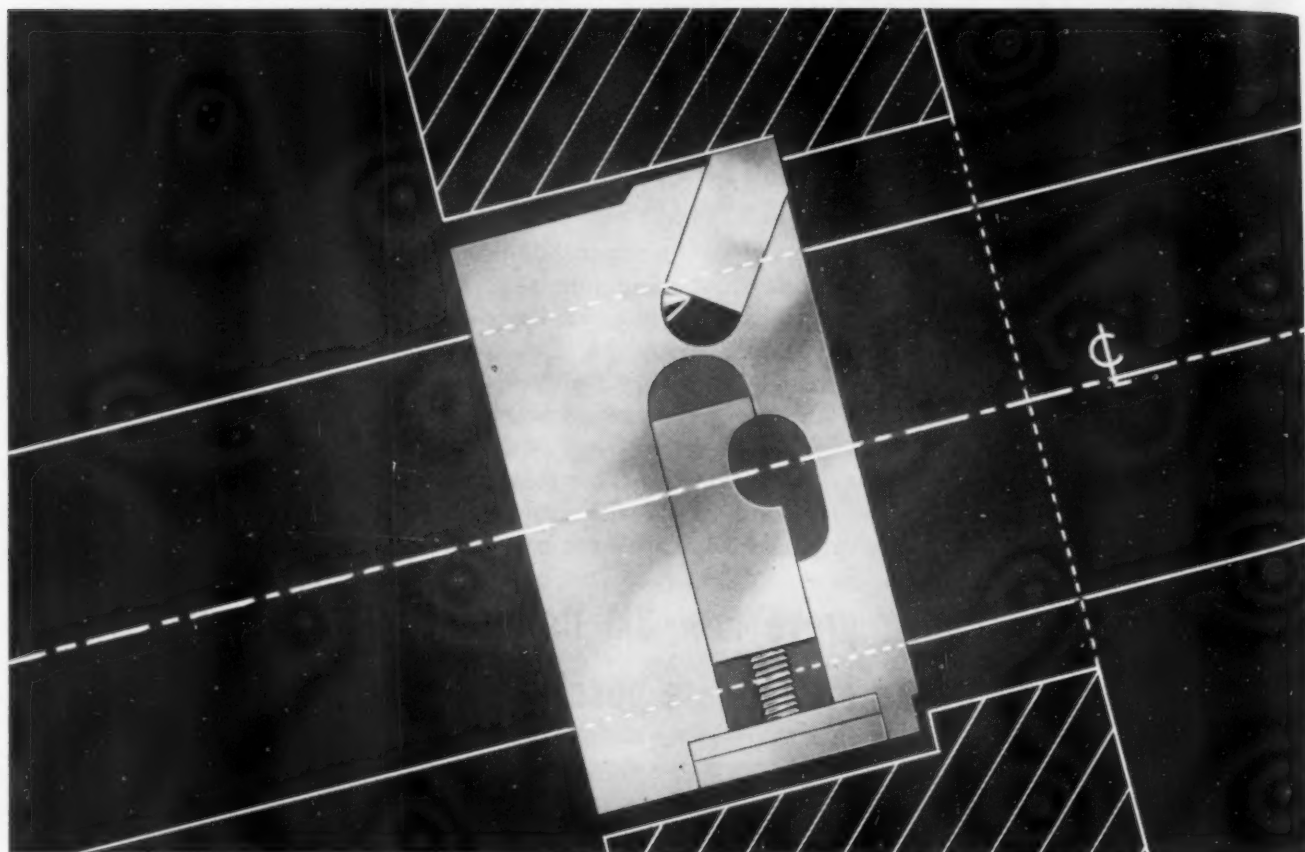
Address

City  Zone  State

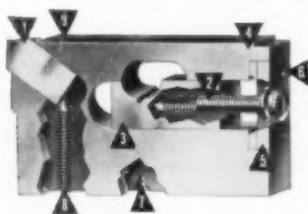


Made in U.S.A. by Minnesota Mining & Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: London, Ont., Can. Export: 122 E. 42nd St., New York City. Makers of "Scotch"® Pressure-Sensitive Tapes, "Scotch"® Sound Recording Tape, "3M"® Adhesives, "Underseal"® Rubberized Coating, "Scotchlite"® Reflective Sheeting, "Safety-Walk"® Non-Slip Surfacing.

**Get fast, positive line boring  
accuracy for 2½" to 17" dia. with...**



## DAVIS SINGLE CUTTER MICROMETER ADJUSTABLE BLOCKS



1. Cutter — Carried in stock of HSS or Tungsten Carbide tipped. Other materials per order.
2. Micrometer adjusting screw.
3. Gib — Hardened and precision ground to fit dovetail slot in block, allows for seating and accurately clamping of block with taper lock screw. The taper lock screw clamps the block firmly against the rear of the slot in the same manner as used in the Davis standard block type construction.
4. Keeper Plate — Retains adjusting screw.
5. Keeper Block — Retains adjusting screw.
6. Keeper Screws — Holds assembly in block.
7. Centers — For circle grinding cutter on diameter.
8. Cutter Support Screw — Supports and adjusts cutter for regrinding purposes.
9. Cutter Lock Screw — Locks cutter firmly in place.
10. Cover Plate — (Not Shown). Dovetailed to fit block prevents entrance of foreign matter into gib and screw assembly.

**H**ERE'S the way to boost efficiency on general purpose jobs that demand rigidity and a wide range of cutter adjustments.

In addition to regular line boring with either standard or special bars, Davis tools with the exclusive adjustable feature are easily adapted to counterboring, undercutting, grooving, facing or chamfering. Block and cutter adjust as a unit to assure full cutter support at all settings.

Made of high grade tool steel, hardened and ground, the blocks can be furnished with High Speed Steel, Cobalt, Stellite, Tungsten Carbide tipped or Tantalum Carbide tipped cutters.

For details, write for bulletin No. 602.

*If Davis can't bore it, it can't be done!*

### DAVIS BORING TOOL DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO., FOND DU LAC, WISCONSIN



Builders of plain and micrometer adjustable block type boring tools; line boring bars; special boring tools; car wheel boring tools; planer, vertical boring and turning mill tools; Quick Change arbors and sleeves.

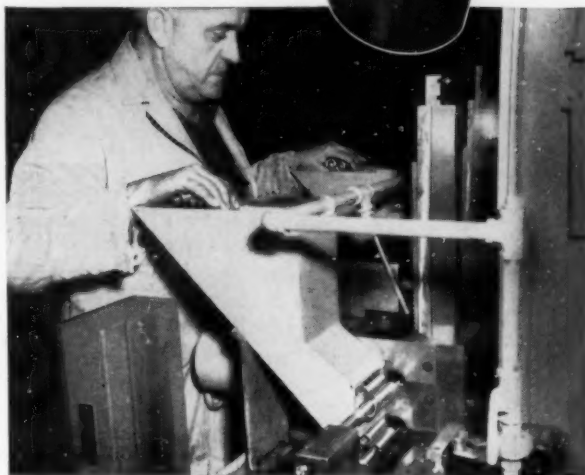
*Continuous, Automatic Cycle  
produces 1150 parts per hour!*

## TYPICAL EXAMPLE OF HIGH PRODUCTION ENGINEERED THE *American* WAY

To broach radius notches in automotive piston pins, American engineers designed a *completely automatic* two station fixture featuring *continuous cycling*. Each station broaches two parts. Installed on an American T-4-24 Broaching Machine, equipped with a special work table, this fixture permits broaching four parts simultaneously . . . produces more than 1150 parts per hour.

### SIX AUTOMATIC OPERATIONS ENGINEERED IN CONTINUOUS CYCLE FIXTURE

The operator has only to keep the gravity-type loading hopper filled with parts. A transfer pusher pushes two parts at each station into position where they are hydraulically clamped in V nests. The main slide starts down broaching the four parts simultaneously. At the end of the stroke the transfer pushers push the part into a chute in the center of the machine where they are ejected. The transfer pushers and broaches return to the starting position and the cycle repeats. All operations are electrically interlocked.



## SOLVE YOUR BROACHING PROBLEMS THE *American* WAY

Continuous, automatic cycling is only one way that American engineers help manufacturers get high production. Perhaps an American-engineered in-

stallation will increase production in your plant. To get American's recommendations send a part print or sample and hourly requirements.



*American* BROACH & MACHINE CO.  
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

**American Building - Ann Arbor, Michigan**

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery





## Oakite's FREE Booklet

"Some good things to  
know about Metal Cleaning"

answers many questions that mean better production,  
more profit for you. Just look at the table of contents:

Tank cleaning methods	Paint-stripping
Machine cleaning methods	Steam-detergent cleaning
Electrocleaning steel	Barrel cleaning
Electrocleaning nonferrous metals	Burnishing
Pickling, deoxidizing, bright dipping	Better cleaning in hard-water areas
Pre-paint treatment in machines, in tanks and by hand	Treating water in paint spray booths
	Rust prevention
	Machining and grinding

**FREE** For your copy of this 44-page illustrated booklet, use coupon below.

Technical Service Representatives in Principal Cities of U. S. & Canada

**OAKITE** SPECIALIZED INDUSTRIAL CLEANING  
MATERIALS • METHODS • SERVICE

Some good things  
to know about  
Metal Cleaning

WHAT'S THE FASTEST  
WAY TO CLEAN METAL?  
See page 11  
WHAT'S THE MOST  
ECONOMICAL WAY?  
See page 9

HAVE YOU TAKEN  
THE  
FOUR GOOD STEPS?  
See page 5 ▶▶▶

## This FREE Booklet Tells You How

In its 28 illustrated pages you'll find the answers to many questions that affect the success of your electroplating on steel. You'll want to read more about:

- ❑ Which costs more: good electrocleaning or poor electrocleaning? See page 4.
- ❑ How can cleaning costs be reduced 33% while plating quality is being improved? See pages 7 and 8.
- ❑ What are four easy ways to improve the average rinse tank? See page 10.
- ❑ What rinsing fault is "an invitation to trouble" in the plating of high-carbon steel? See page 11.
- ❑ Why is it better to clean steel with reverse current than with direct current? See pages 12 to 14.
- ❑ What causes hydrogen embrittlement during electrocleaning? What is the remedy? See pages 15 and 16.

**FREE** For a copy of "Four good steps toward better electroplating on steel" use coupon below.

Technical Service Representatives in Principal Cities of U. S. & Canada

**OAKITE** SPECIALIZED INDUSTRIAL CLEANING  
MATERIALS • METHODS • SERVICE

Four good steps  
toward  
better  
electroplating  
on steel

## Oakite's FREE Booklet on Paint Stripping

WHAT'S  
THE BEST WAY TO  
STRIP PAINT FROM  
METAL PARTS  
TOO LARGE TO BE  
SOAKED IN TANKS?  
See page 3



answers many questions that will lead you to better stripping procedures. You'll want to read more about:

What's the best way to strip large areas of structural metal where a steam supply is available? See page 5.

What's best when steam is not available? See page 7.

What is the cheapest way to strip metal parts in large volume? See page 9.

What are the best ways to prepare stripped surfaces for re-painting? See page 11.

What strippers are best for removing oil-base paints? ... Synthetic enamels, alkali-resistant plastics or resin-based paints? ... Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? See page 12.

**FREE** For a copy of "How to Strip Paint" use coupon at right.

Technical Service Representatives in Principal Cities of U. S. & Canada

**OAKITE** SPECIALIZED INDUSTRIAL CLEANING  
MATERIALS • METHODS • SERVICE

THESE  
BOOKLETS HELP YOU  
SAVE MONEY

### OAKITE PRODUCTS, INC.

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- ☐ Send me a FREE copy of "Four good steps toward better electroplating on steel"
- ☐ Send me a FREE copy of "How to STRIP PAINT"


**ALSO** tell me about Oakite methods for removing the following soils:

- ☐ buffing compound residues
  - ☐ pigmented drawing compounds
  - ☐ oils and greases
  - ☐ rust, oxides
  - ☐ heat scale
  - ☐ flux residues
  - ☐ carbon smuts
  - ☐ tarnish
  - ☐ rust preventives
- other soils \_\_\_\_\_

NAME \_\_\_\_\_

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OW JESSOP  
makes a steel  
sandwich to  
save you money!

Under a highly-prized patented process, Jessop is able to build a sandwich of fine corrosion-resistant stainless steel sections, permanently bonded to mild carbon steel slabs, so that after rolling, gleaming plates of superlative quality stainless-clad steel appear. The stainless analysis may be in accordance with any reasonable standard and the percentage thickness may be from 10 to 50 percent.

Jessop customers find great value in this "sandwich-made" steel. It has forming advantages, price advantages, and it saves vital materials. This is one of the most widely used of Jessop's specialty steel products since nearly every industry has found an application and a saving thereby. But that is not the prime point of this story. A few other companies make stainless-clad steel, but we claim they can't match us, because *we want business so much we'll give better service to obtain and keep it.* Send us an order and find out.

# JESSOP

STEEL COMPANY • WASHINGTON, PENNSYLVANIA

# He Went Out to Meet Them

WITH FLARES AND WHISTLES and blaring bugles, the Reds had been attacking fanatically all night. Wave after wave they came, in overwhelming numbers.

By dawn, Jerry Crump could see that his position alone was keeping them from overrunning L Company. Twice he went out to meet them with his bayonet. Once he retook a captured machine

gun. And four times he left shelter to bring in wounded comrades.

Now, an enemy soldier crept close unobserved. He lobbed a grenade. It landed squarely among the wounded men. Without a second's hesitation, Corporal Crump threw himself upon it, smothered the explosion with his own body, and saved his four companions' lives.

"I got hurt," says Jerry Crump, "but I got back alive. Because our armed forces have the finest medical equipment in the world—even at the front. And you helped put it there by investing in United States Defense Bonds."

Bonds are savings. But they mean production power, too. Helping provide the arms and equipment and care of every kind that give a fighting man more than a fighting chance.



*Corporal  
Jerry Crump  
U.S. Army*

*Medal of Honor*



**Now E Bonds pay 3%!** Now, improved Series E Bonds start paying interest after 6 months. And average 3% interest, compounded semiannually when held to maturity! Also, all maturing E Bonds automatically go on earning—at the new rate—for 10 more years. Today, start investing in United States Series E Defense Bonds through the Payroll Savings Plan at work.

Peace is for the strong! For peace and prosperity save with U.S. Defense Bonds!

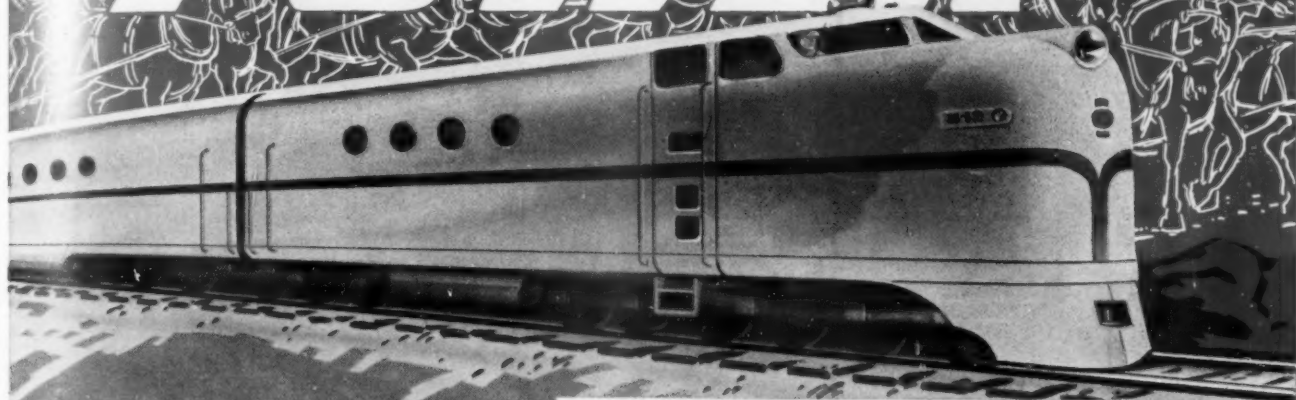


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**AMERICAN SOCIETY OF TOOL ENGINEERS  
10700 Puritan Avenue Detroit 21, Michigan**



# POWER



*delivered by  
Microhoned Surfaces*

... Diesel principle and the Microhoning process combine to help produce the most efficient engine in the world!

Because diesel engine parts must be able to bear and deliver tremendous power, important load-carrying surfaces are Microhoned.

The Microhoning process develops a surface that can withstand intense force. There is no torn, burned or smeared metal that might flake or wear off quickly. All the bores are round, straight and accurate to close tolerances.

**THAT'S WHY**—the cylinder liner,

—the cross head,

—the connecting rod . . . all which must hold the compression and transmit the terrific thrust are **MICROHONED!**



For more information on Microhoning, write for free copies of *Cross Hatch*. Address Field Engineering B-4, 8100 Schoolcraft, Detroit 4, Michigan



**MICROHONING—STOCK REMOVAL+GEOMETRY+SIZE CONTROL+SURFACE FINISH**

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REPRESENTATIVES: Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado  
Hallidie Machinery Co., 2726 First Ave., South, Seattle, Wash. • REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

# **R and L TAP AND DIE HOLDER**

**Patented instant release action  
readily changes to left hand threading**

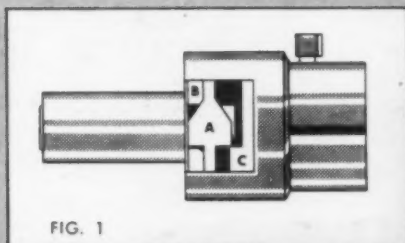


FIG. 1

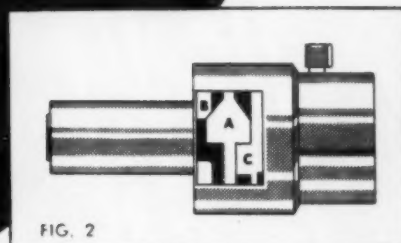
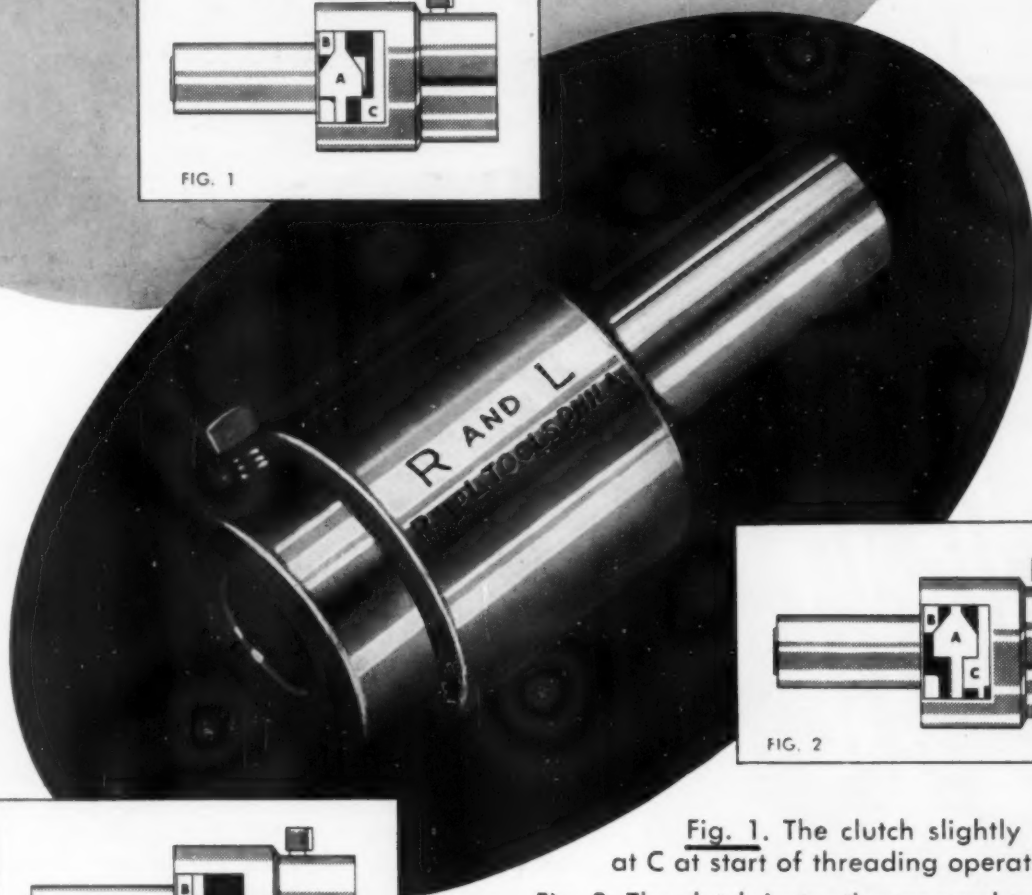


FIG. 2

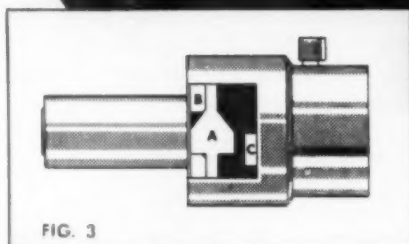


FIG. 3

*Write for  
complete catalog*

**Fig. 1.** The clutch slightly engaged at C at start of threading operation.

**Fig. 2.** The clutch instantly engaged to full contact between A and C at moment tap or die engages work.

**Fig. 3.** Fully released, there is ample clearance between clutch's contact points.

Note: A shorter clutch ring retaining nut can be substituted for operation on extra short threads.

**RIGHT R and L LEFT TOOLS**  
1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL  
RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS

WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 1)

# NEW METALS FOR AN ATOMIC AGE

"PIONEERS OF THE UNCOMMON" IN METALLURGY

For 64 years we have been pioneering in the research, development and production of special purpose steels and, more recently, powdered metals.

Not content to become just another tonnage producer of established grades, Firth Sterling has successfully paced the field in *anticipating* the requirements of science and industry, so that the exactly *right* metal is *ready* when a new need arises.

Now, in an era of jet engines and atomic power, Firth Sterling *has* the necessary high temperature alloys and cermets, Firth heavy metal, chromium carbides, zirconium alloys, and stainless specialties . . . as well as both new and conventional grades of high speed steels, tool and die steels, and sintered tungsten carbides.

To accomplish this metallurgical preparedness, research at Firth Sterling had to be expanded several fold. The best of new American and European processes and equipment were blended into integrated production facilities. The metallurgical brains of the world are "picked" regularly by consultation with Firth Sterling's international panel of renowned scientists and engineers.

The job is done, for today, yet *even* today we are already working on the metallurgical needs of tomorrow.

Your inquiries are invited.

*Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future*

## **Firth Sterling**

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES\* AND WAREHOUSES: BIRMINGHAM\* CHICAGO CLEVELAND DAYTON\* DETROIT  
HARTFORD HOUSTON\* LOS ANGELES NEW YORK\* PHILADELPHIA\* PITTSBURGH\* WASHINGTON\*



HOW

**BIG**

IS A POUND?

That depends! To a woman, perhaps the size of a print of butter. To a grocer, maybe the size of a box of sugar.

To a Firth Sterling metallurgist, something else!

To him it might mean the size of a piece of remarkable new metal, so dense, so heavy in relation to its bulk, that a pound of it would measure hardly more than a *one inch cube*! Looking for all the world like steel but weighing  $2\frac{1}{2}$  times as much . . . that is Firth Heavy Metal.

Developed originally and now being used to shield the gamma rays of atomic energy, the phenomenal weight to volume ratio of this material also makes it invaluable in gyroscopic applications and for scientific instruments where balance is essential.

But, while Heavy Metal is important of itself, its larger significance is to mark, once again, Firth Sterling's continuing progress in the field of metallurgical achievement through accent on research and development. The ultimate goal is *leadership* in products and processes that meet the ever increasing demands for special metals in an atomic age.

P-6

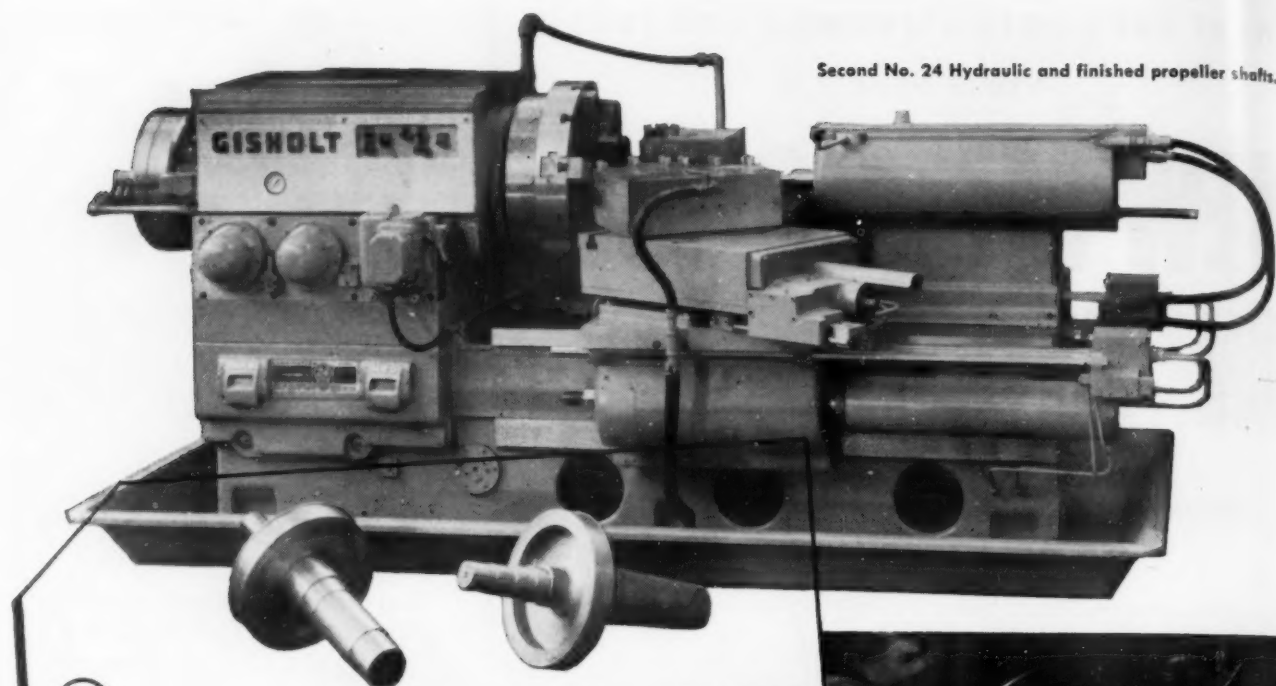
### PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels  
Tool & Die Steels  
Stainless Specialties  
High Temperature Alloys



Sintered Tungsten Carbides  
Firth Heavy Metal  
Chromium Carbides  
High Temperature Cermets





Second No. 24 Hydraulic and finished propeller shaft.

**AIRPLANE PROPELLER SHAFTS  
AT BARGAIN PRICES!**

## from GISHOLT No. 24 AUTOMATIC LATHES

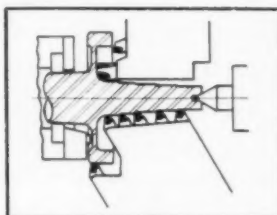
For speed and precision on these hefty drive gear and propeller shafts, production is divided between a pair of Gisholt No. 24 Hydraulic Automatic Lathes. The first machine gets the 275 lb. steel forging for nine different turning, chamfering, and facing operations on the 16" gear blank and five-shaft diameters. 12 minutes later, the part moves to the second machine where nine tools perform similar work on the other side of the flange. Time again is 12 minutes.

Together, the two No. 24 Hydraulics remove a total of 75 lbs. of material. One man operates both machines. Another tough job handled to perfection by these high production machines.

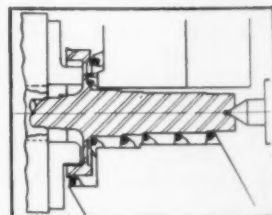
The Gisholt No. 24 Hydraulic, like the famed smaller No. 12 combines ease of setup with exceptional speed and accuracy—all with fully automatic operation that means low costs on any job. If you have work up to 24" diameter, you should have full details on the rugged, powerful, No. 24 Automatic.



First No. 24 making chips on small end of shaft.



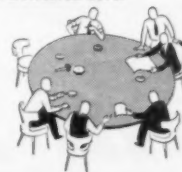
Tool arrangement for first operation.



Tool arrangement for second operation.

### THE GISHOLT ROUND TABLE

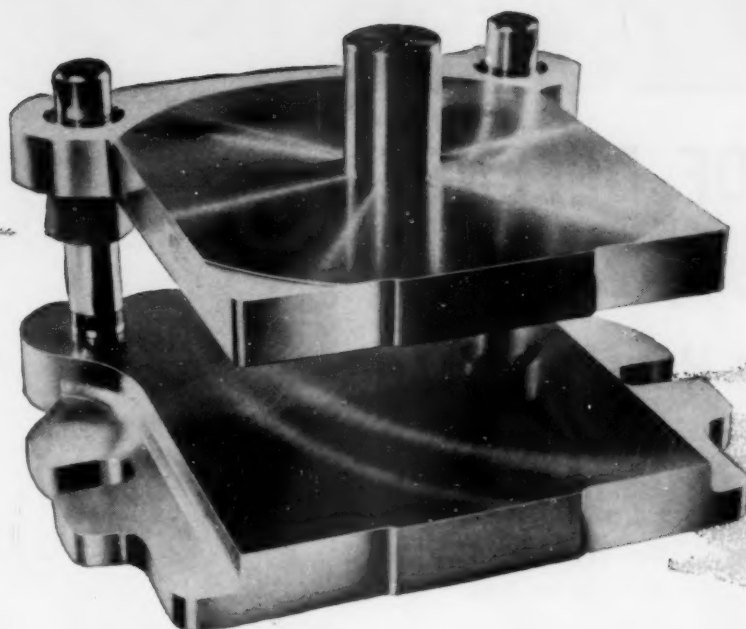
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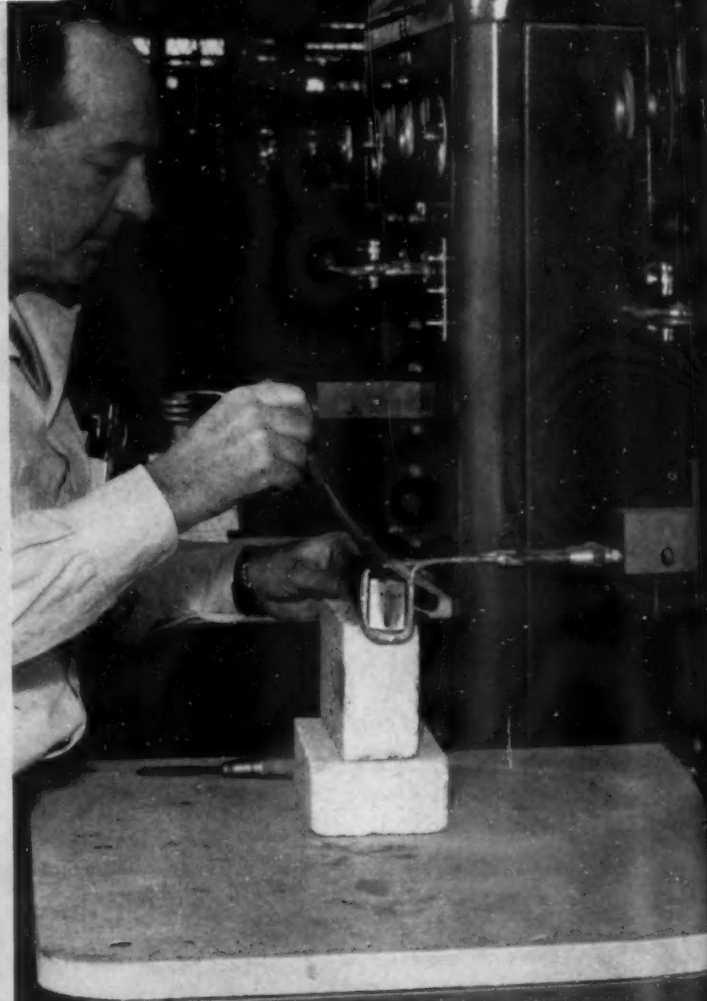
Investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.

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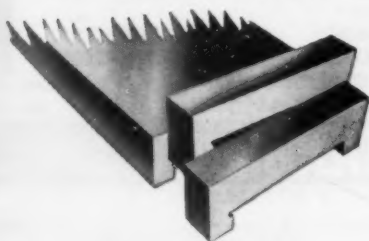




# HOW HARD are OK hardened ways?

## ONE CUSTOMER SHOWED US BY:

Taking a section  
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Making it into a  
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Then cutting metal with it  
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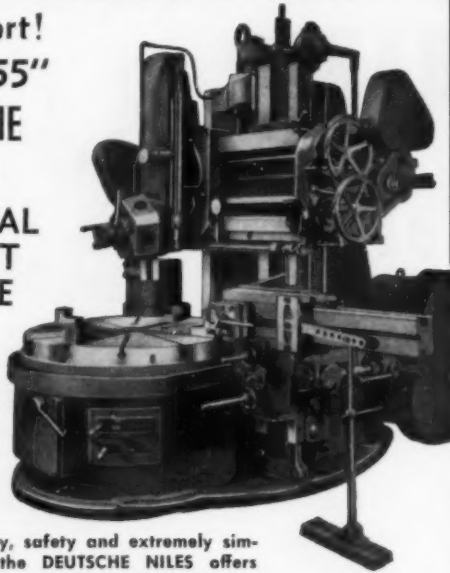
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ENGINEER, USE THE HANDY READERS SERVICE  
CARD ON PAGE 133.

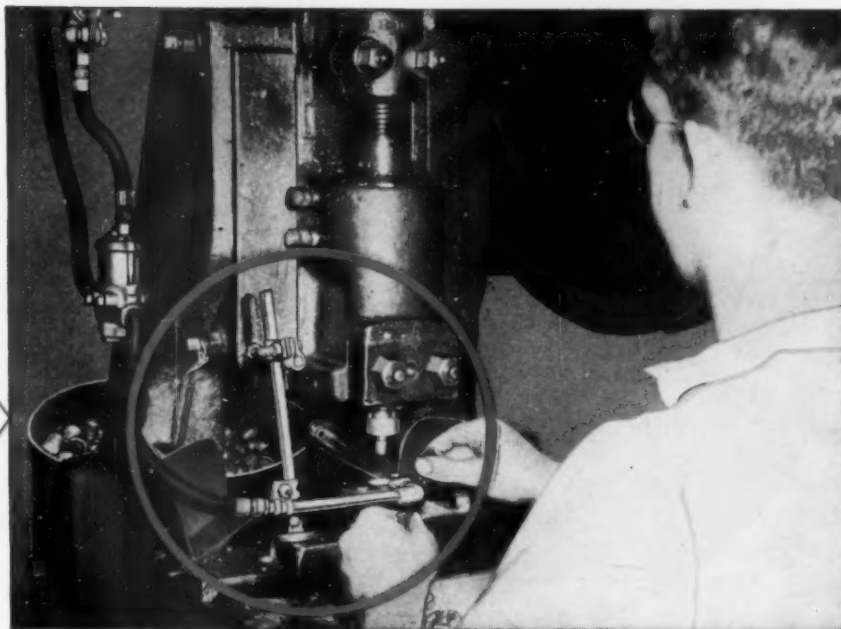
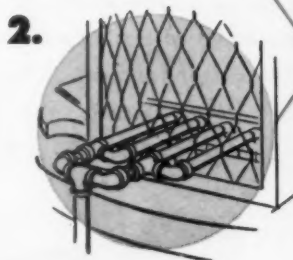
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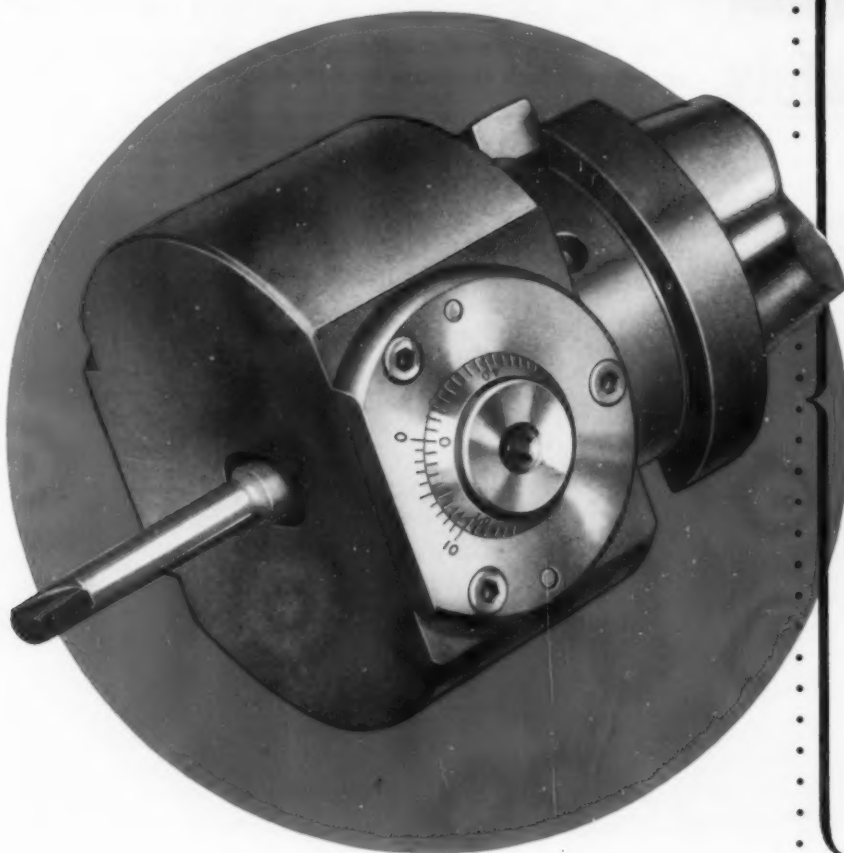


Illustration at right shows boring head with standard set of boring tools mounted in a fitted hardwood case.

### The NEW MICROBORE MB-121 ADJUSTABLE BORING HEAD

This Boring Head is adjusted rapidly and accurately by means of proven Micrometer Vernier principle. The tool slide can be adjusted in accurate increments from zero to  $\frac{1}{4}$ " off center. The boring head can be furnished with straight, taper, or flanged type shanks to suit any make of boring machine. With a standard set of boring tools, bores ranging from  $\frac{1}{4}$ " to 1" diameter can be machined.



For the latest developments in precision tooling consult

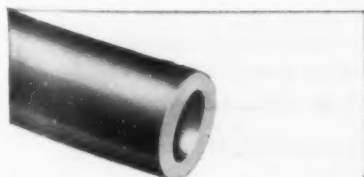
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first name in special purpose steels

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July, 1953

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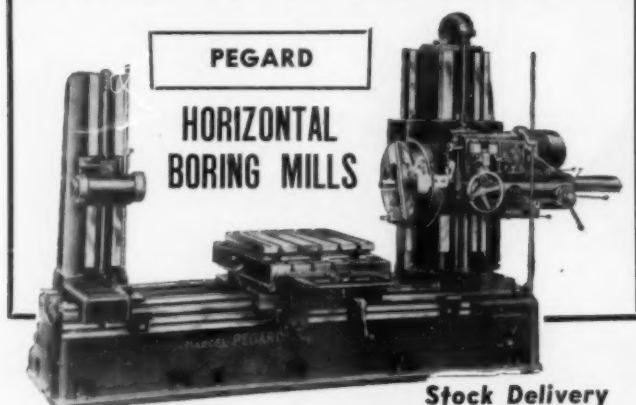
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Designed for high speed precision work . . .



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PARTIAL SPECIFICATIONS	Spindle diameter	3-5/32"	3-15/16"
	Spindle traverse	31-15/32"	39 3/8"
	Spindle speeds	18	18
	Facinghead speeds	6	9
	Long. traverse of table	51-3/16"	63"
	Motor	7 HP	13 1/2 HP

Write today for full details and specifications!

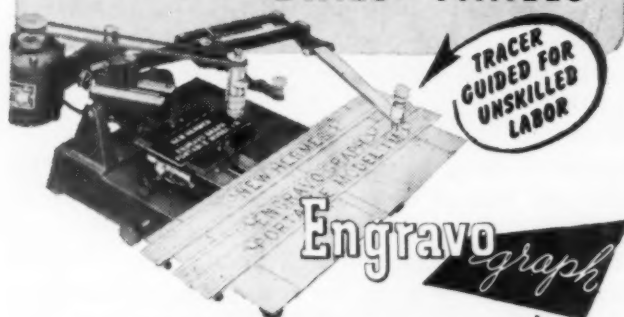
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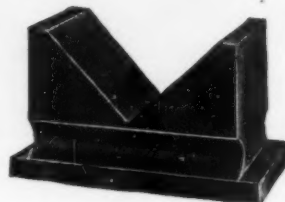
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LOOK for this  
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Carbide cutting tools made to your own specifications.

A complete line of Standard Carbide cutting, turning and boring tools. Available immediately from stock.

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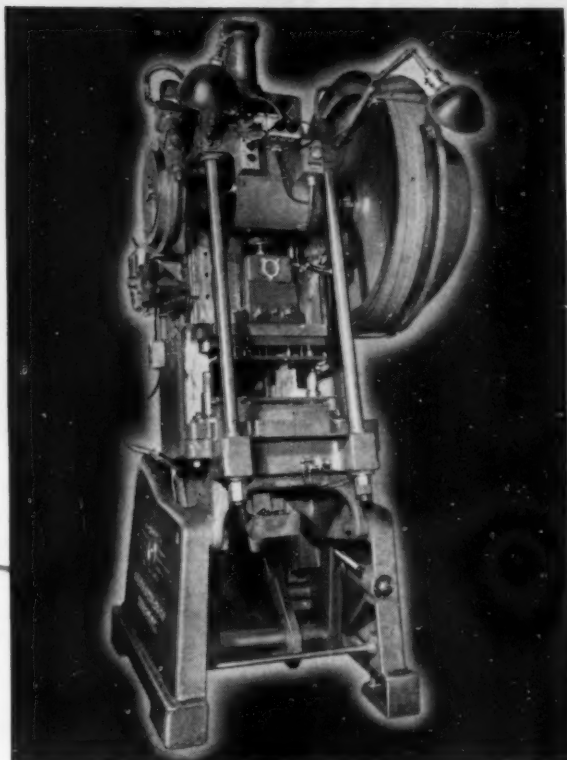
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*What does this press  
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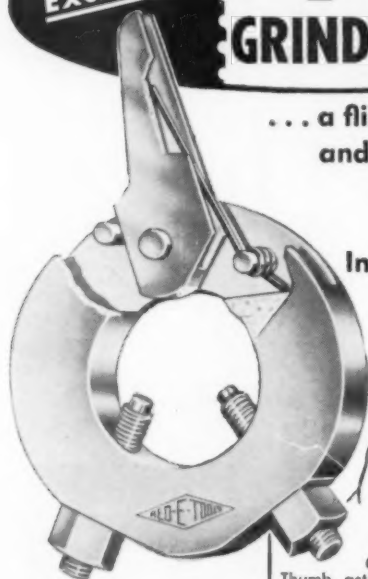
Whether your production calls for the use of a simple hand "mike", or high production dial indicator comparators, as shown at the left, there are Tumico precision tools to make your production flow smoother and faster. Write for our new catalog.

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Increases production  
saves } time,  
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Thumb action releases pressure of cam.

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TIMES LONGER  
THAN ROTARY FILES  
OF HIGH SPEED

**REGROUNDING**—Due to CARBO-MILLS being made of Solid Carbide repeated savings are made possible through successive regrinds.

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**CARBO-MILLS ASK NO SPECIAL FAVORS**

**3/32" SHANKS**

7 Standard Numbers, featuring REAL cutting teeth to remove stock faster over long periods of use—as well after regrinding as when new.



**CARBO-MILLS by the ORIGINATOR of Ground-from-the-Solid Mills**



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12 STANDARD NUMBERS  
THE POPULAR  
WORK BENCH SET**

**CARBO-MILLS PREFERRED BY OPERATORS!**



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20 Standard Numbers (only 9 illustrated) cover the widest possible range of uses. Don't continue losing valuable time and money; replace your less efficient Rotary Files with these longer lasting, faster cutting, stamper possessing, CARBO-MILLS at the earliest possible moment!

**DIE MAKERS!  
ASK FOR THIS SET**

Furnished to you in a sturdy wooden case, Divisor Set No. 40 is a set of 8, 1/4" shank CARBIDE mills designed and instituted specifically for you, the Tool and Die Maker. Specially selected shapes—Special tooth patterns and cuts for all types of precision Tool and Die work. You will ply your skills easier and faster than ever before with these personal finishing mills. These CARBIDE mills need absolutely no coddling and will win their way to the most favored spot on your Work Bench! Send for complete information and prices today! Ask for Leaflet No. 645

... GROUND-From-the-Solid ...



## Parts for PROCTOR Irons and Toasters Produced RAPIDLY and ACCURATELY Using U. S. Automatic Press Room Equipment



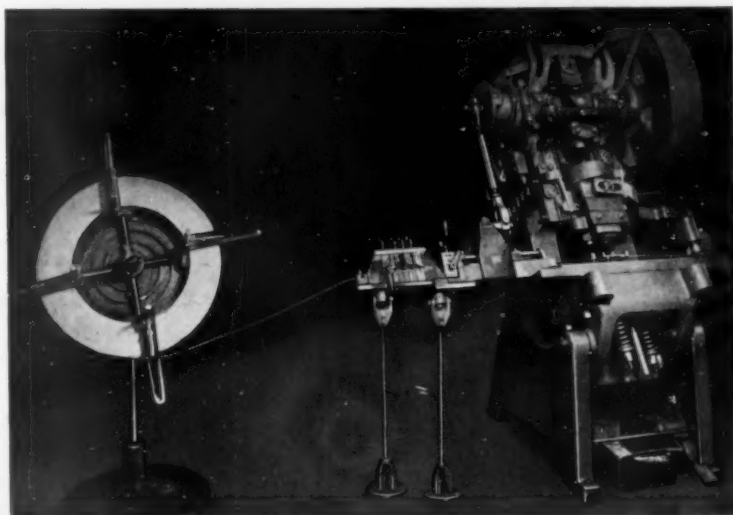
The production program at Proctor Electric Company, Philadelphia, Pennsylvania, famous manufacturers of appliances, calls for the fabrication of many different types of metal stampings for use in Proctor Irons and Toasters.

The precision inherent in end products of this type naturally results from the accuracy with which the component parts are produced. To insure the desired result, conventional punch presses at Proctor Electric Company are equipped with U. S. Slide Feeds and Straighteners. U. S. Slide Feeds are generally recognized for their extreme accuracy, dependability and versatility. The U. S. Slide Feed can pull material (within its capacity) through a plain stock straightener and still maintain controlled accuracy of feed length. Also, U. S. Slide Feeds can operate at speed as high as can be provided by conventional punch presses.

If your operations include the production of metal stampings, ask for a copy of Bulletin 80-T on U. S. Automatic Press Room Equipment.

*The parts illustrated above are just a few of the different types of metal stampings being produced at Proctor Electric Company on conventional punch presses arranged with U. S. Slide Feeds, Stock Straighteners and Stock Reels.*

*The photograph below shows a typical setup of conventional punch press equipped with U. S. Slide Feed, Straightener and Stock Reel for holding the coils of material.*



# U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories



*Lower*  
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**SAME QUALITY**



Get this **NEW BOSTON** *gear*  
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New **LOWER** prices, based on larger volume, and on engineering and production economies, mean substantial savings for all sprocket buyers, whether typical order is large or small.

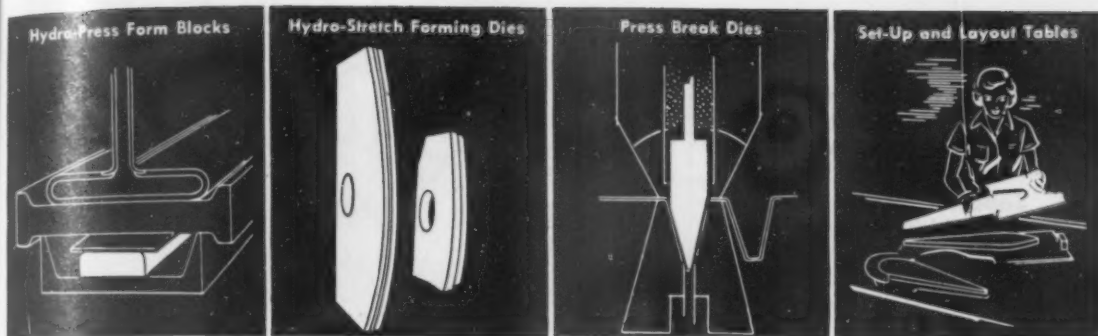
Now, more than ever

**BOSTON Gear SPROCKETS** are your Best Buy!

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**BOSTON** *gear*  
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for the new Sprocket Catalog Supplement SC-2 or write:  
 Boston Gear Works, 60 Hayward St., Quincy 71, Mass.



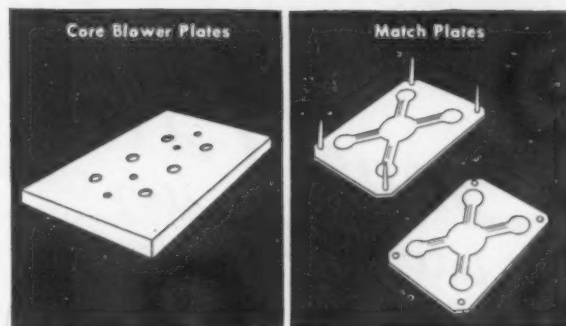
# LOWER YOUR COSTS for TOOLS, DIES & FIXTURES

## with REYNOLDS ALUMINUM CAST PLATE & BAR

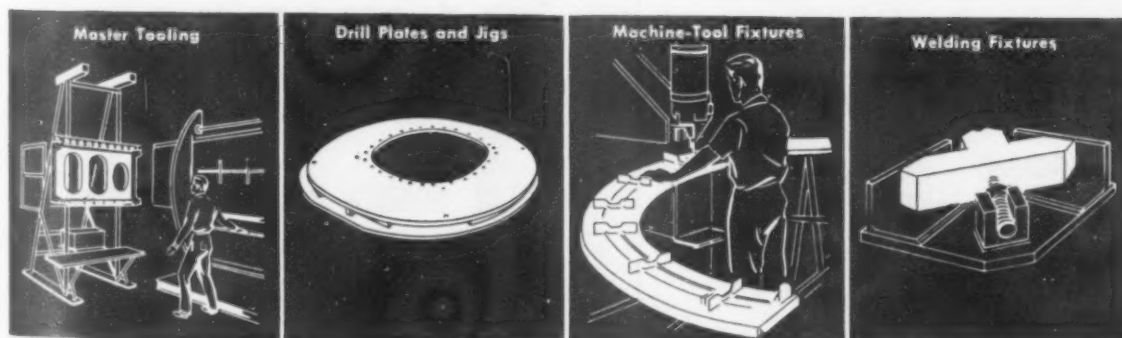
Your low production and experimental runs no longer need to be a problem. Tools, dies and fixtures made from Reynolds Aluminum cast and machined plate and bar will give you high dimensional stability, better performance and longer production life than other low cost stock. The outstanding features of this revolutionary material include fine grain structure; precision surfaces; light weight; low cost; fast, free machining; good weldability; excellent thermal characteristics and a wide range of popular standard sizes.

First proved superior in the aircraft industry, cast aluminum plate and bar has simplified production problems in many industries. No other material can match its advantages at so low a cost.

For full details on Reynolds Aluminum Cast Plate and Bar, call your nearby Reynolds office listed under "Aluminum" in the classified telephone directory, or write Reynolds Metals Company, 2525 South Third Street, Louisville 1, Kentucky.



*Write for free brochure,  
"Reynolds Aluminum Cast Plate  
and Bar for Machine Shops,  
Foundries and Pattern Shops."*



# REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

July, 1953

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-219

219



**SOLID carbide for greater rigidity, increased accuracy**

**Superior grade of carbide assures longer tool life**

**Master-machined for greater concentricity, precision work**

**Operates efficiently at grinding wheel speeds**

**No down time for dressing — maintains size and shape**

**Most efficient tool for small hole finishing**

**Save 75%**  
*of internal grinding time with*

**FORD**

**SOLID CARBIDE**

**Grinding Burs**

Yes, in only one-fourth the production time required by use of mounted points, FORD solid carbide grinding burs will remove material hardened up to 68 RC. Save down time, tool cost. Ford carbide burs can be resharpened many times and still retain new-tool accuracy. Let us prove it. Write today.



**FORD -- the complete line!**

HSS ground cutters, rotary files and countersinks. CARBIDE cutters, end mills and grinding burs. Get complete details plus operational data on over 300 Ford rotary tools in new Catalogue No. 207.

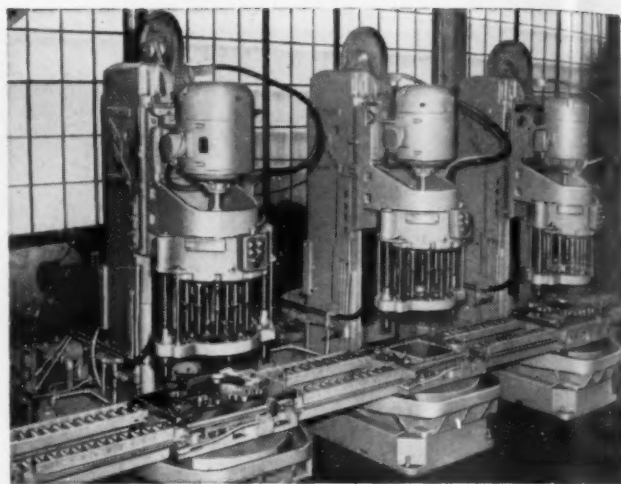
*FORD regrounding service adds tool life, reduces tool costs!*

**M. A. FORD MFG. CO., INC.**

*Pioneers in rotary tools for more than 30 years*

**DAVENPORT 9, IOWA**

USE READER SERVICE CARD; INDICATE A-7-220-1



### Standard No. S.O. 4132

A 3-column hydraulic drilling, counter-boring, and taper reaming machine equipped with three-25 H.P. STANDARD DRILL-MASTERS.

Attached to each column is a 14-spindle head with tooling to suit successive operations. Fixtures move from station to station on a roller conveyor.

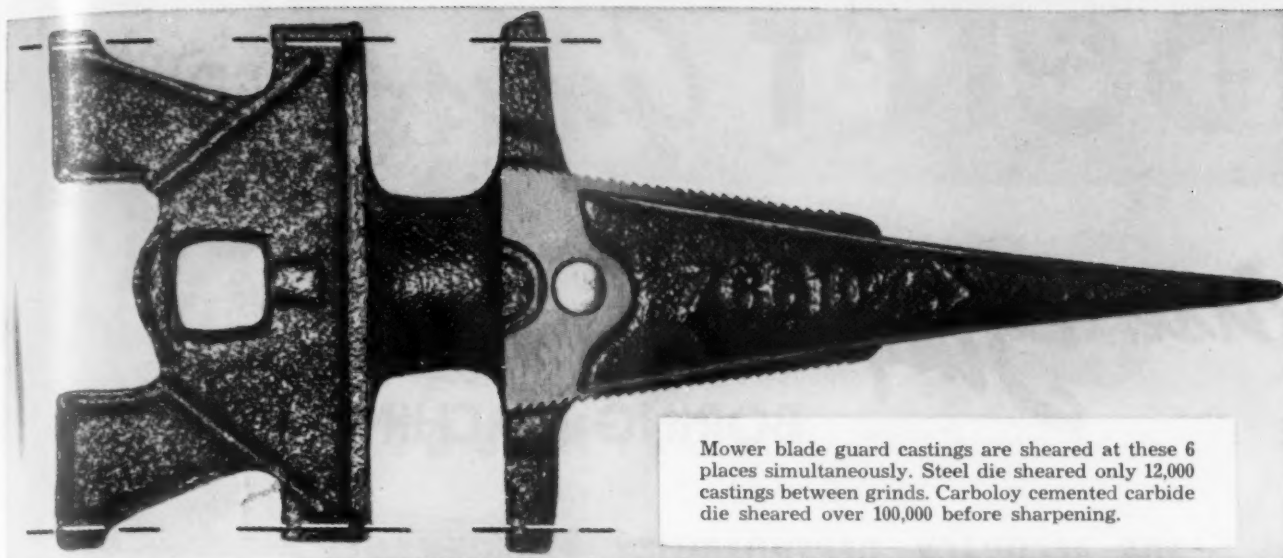
Designed to drill, counterbore, and taper ream holes in sprockets.

**STANDARD MACHINE AND TOOL CO., LTD.**  
WINDSOR, ONT.  
U.S.A. Sales Representative,  
ARNOLD J. WERNER CO.,  
New Center Bldg.,  
Detroit 2, Mich.

USE READER SERVICE CARD; INDICATE A-7-220-2

To Obtain Further Information About  
Advertisers, Trade Literature or  
Tools of Today Appearing in this  
Issue of The Tool Engineer, Use the  
Handy Readers Service Card on  
Page 133.





Mower blade guard castings are sheared at these 6 places simultaneously. Steel die sheared only 12,000 castings between grinds. Carboloy cemented carbide die sheared over 100,000 before sharpening.

### OLIVER CORPORATION REPORTS—

## Carbide inserts increase die life over 800%!

**Carboloy cemented carbide on cutting edges of trim block shearing die increased production from 12,000 to well over 100,000 pieces between grinds!**

**WHEN THE** Oliver Corporation switched from a steel die to a die equipped with Carboloy cemented carbide, things happened!

Carbide's stay-sharp-longer feature increased trim block life from one day to more than 8 days between

grinds. It increased production, lowered maintenance costs, cut rejects, slashed downtime. There was no chipping or cracking of carbide under continuous impact; little grinding was needed to restore cutting edge.

Perhaps you have a die job — simple or complex, large or small — where you can get the same benefits. If so, have a Carboloy representative stop at your plant, show you how easily Carboloy cemented carbides can be profitably applied to almost any blanking, forming, drawing or piercing die.

Send coupon for free Carboloy Die Engineering Manual D-124 containing details on carbide applications.

**CARBOLOY**  
DEPARTMENT OF GENERAL ELECTRIC COMPANY

**MAIL TODAY**

**CARBOLOY Department of General Electric Company**  
11101 E. 8 Mile Road, Detroit 32, Michigan

Gentlemen:

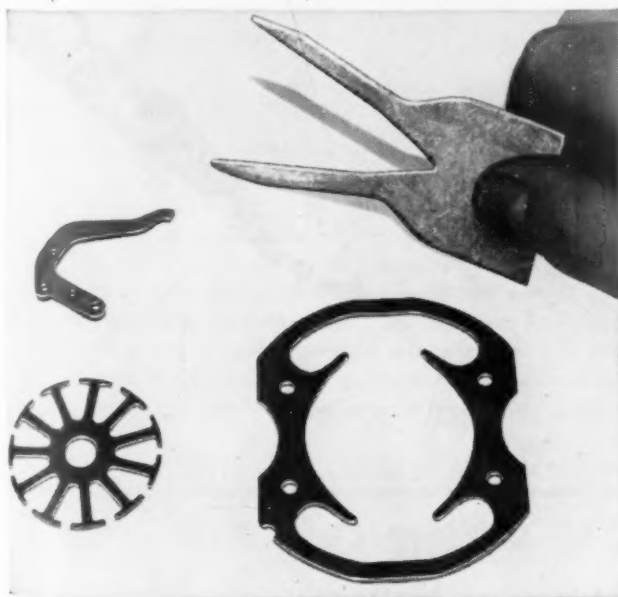
- ☐ Send me, free, your helpful Die Engineering Manual D-124.  
☐ Have a Carboloy representative call at my plant.

Name \_\_\_\_\_ Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



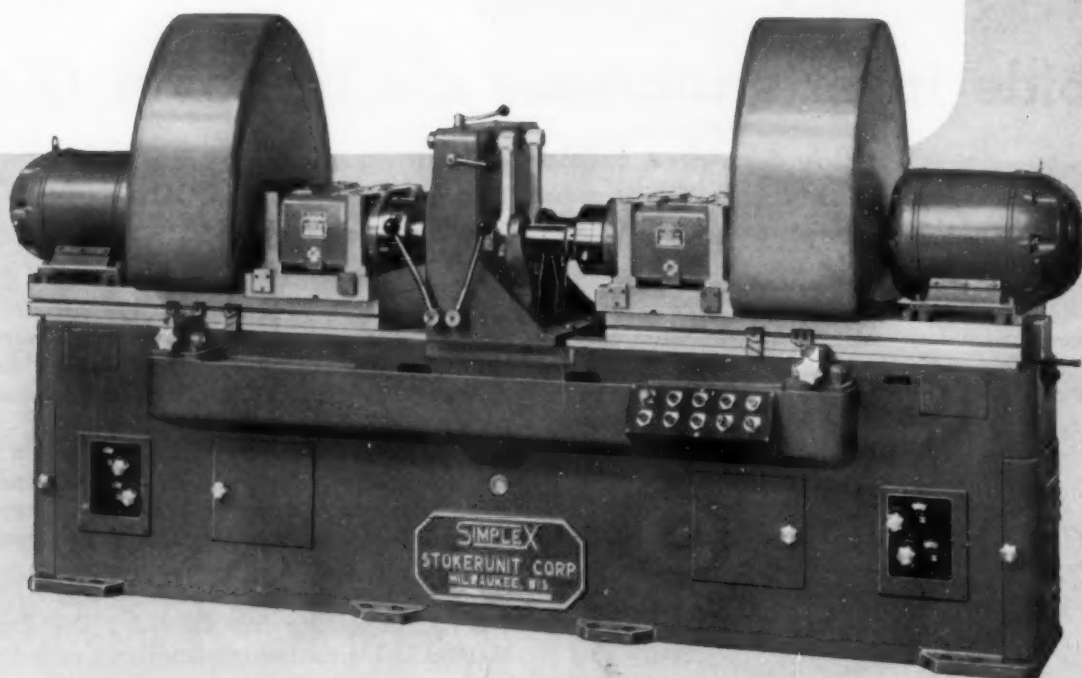
Typical parts being produced by industry on carbide dies. Dies of Carboloy cemented carbide outlast steel dies 10 to 50 times. Produce burr-free, close tolerance parts with a minimum of maintenance and downtime.

"Carboloy" is the registered trademark for the products of the Carboloy Department of General Electric Company

# DON'T *Guess!*

## Use *Simplex* PRECISION BORING MACHINES

FOR ACCURACY, DEPENDABILITY, PERFORMANCE



The crank pin bore of a heavy steel connecting rod was successfully bored and held to close machining tolerances on the SIMPLEX #2U 2-way Unit Type Precision Boring Machine pictured above. The two SIMPLEX #4 precision boring heads on the left hand table of the machine were used to semi-finish bore and chamfer one side of the crank pin bore, and the remaining two heads on the right hand table were used to finish bore and also chamfer the opposite side of the part. Both machining operations were performed without removing the connecting rods from the fixture. This method of machining insured a higher accuracy and also a good finish in the bore.

# *Simplex*

## PRECISION BORING MACHINES

SIMPLEX MACHINE TOOL DIVISION

STOKERUNIT CORPORATION  
4528 WEST MITCHELL STREET

MILWAUKEE 46, WISCONSIN

PRECISION BORING MACHINES

• PLANER TYPE MILLING MACHINES

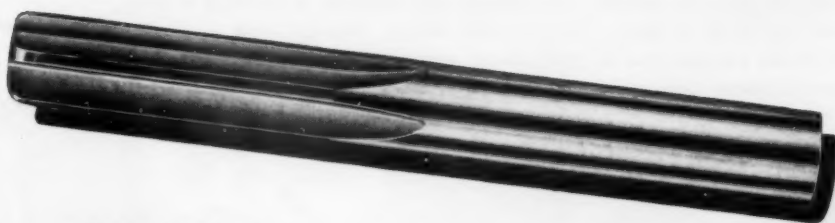
• SPECIAL MACHINE TOOLS

AT  
RAX

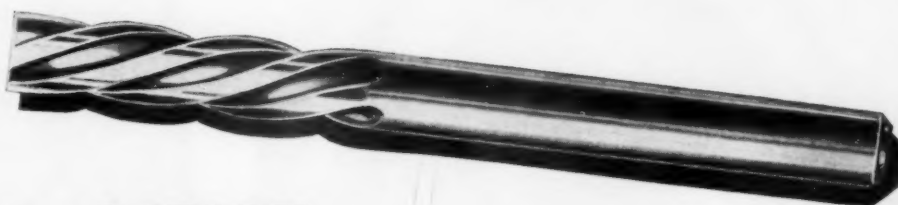
**is for ATRAX . . .** the finest of cutting tools.



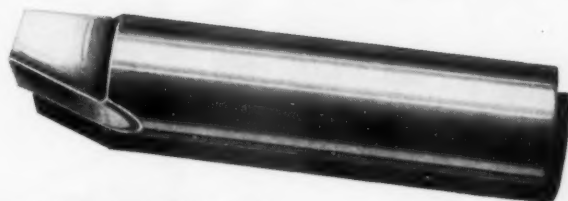
**is for TOUGH . . .** they're solid tungsten carbide.



**is for RIGHT . . .** they're precision ground-from-the-solid.



**is for ACTION . . .** when Atrax tools solve difficulties in your production line.



**is for X-TRAS . . .** Atrax tools give with longer service, less trouble, better profits.

Representatives and Distributors in principal cities in United States and Canada. Write for name of representative in your area.



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complete  
catalog  
NOW!

THE  
**ATRAX** COMPANY

NEWINGTON 11,  
CONNECTICUT

July, 1953

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223



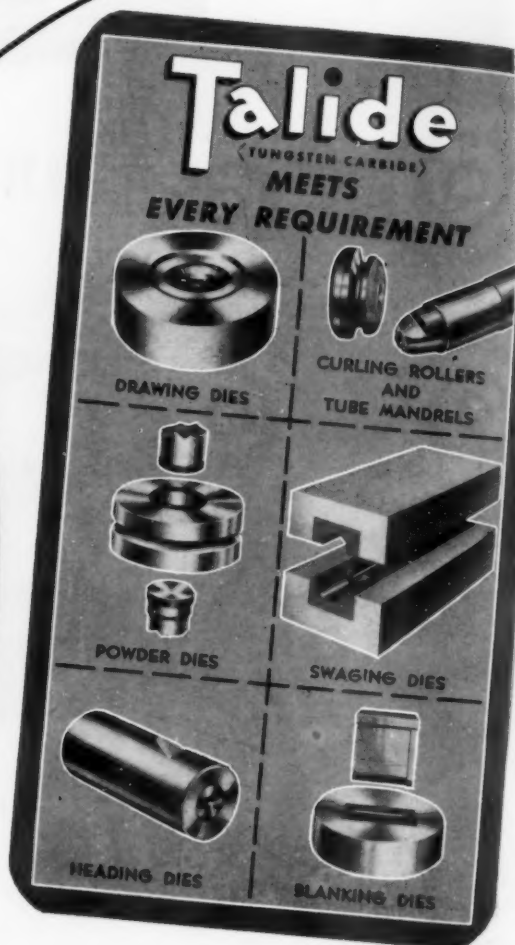
# LONG, UNINTERRUPTED SERVICE WITH RUNS OF A MILLION PIECES OR MORE

**TALIDE CARBIDE DIES** outwear steel dies on most applications by at least 50 times. The 79 Rockwell "C" hardness (hardest steel 68 "C") of Talide Nibs assures long runs before redressing. The Alloy Steel Case, plus our special mounting process, is accurately calculated to withstand severest drawing pressures and increase both transverse and longitudinal nib strength. A diamond-lapped Micro-Inch Finish imparts a lustrous finish to drawn parts and minimizes pickup, scoring and scratching. 750,000 p.s.i. compressive strength and 95,000,000 p.s.i. modulus of elasticity (3 times steel) holds tolerances to .0001". You have few rejects. You can triple production runs with Talide Carbide Dies on your present equipment. For further information, write Metal Carbides Corporation, Youngstown 7, Ohio.



## YOUR INQUIRY

Prompt attention is given to all inquiries. Send us prints or parts for estimating and recommendation. Ask for Catalog 52-G.



# FOR YOUR

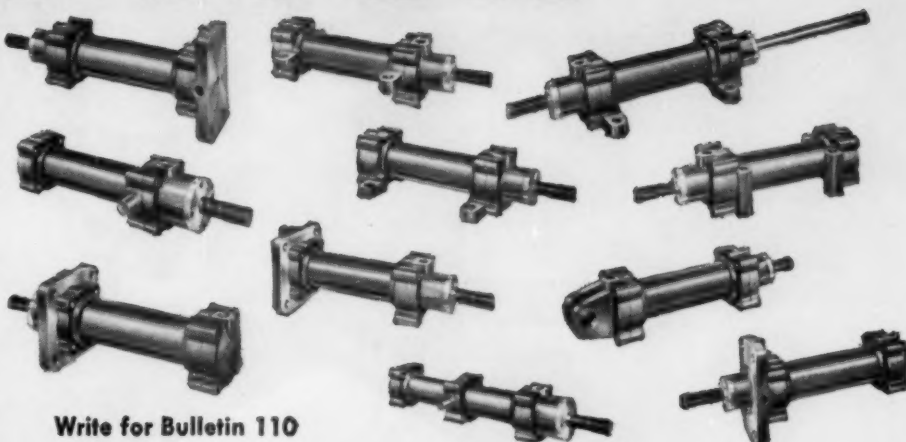
## SERIES "N" HYDRAULIC CYLINDERS

● Long recognized as the finest hydraulic cylinder made.

● No tie rods; ideal for long-stroke applications

● 12 bore sizes, 1" to 8"

● 11 mounting styles; many combination mountings available



Write for Bulletin 110

# HYDRAULIC

## ADVANTAGES

1. Ground steel piston rod. Concentric with and locked to piston

2. Pre-adjusted chevron packings in non-adjustable gland. This eliminates over-tightening, binding, etc.

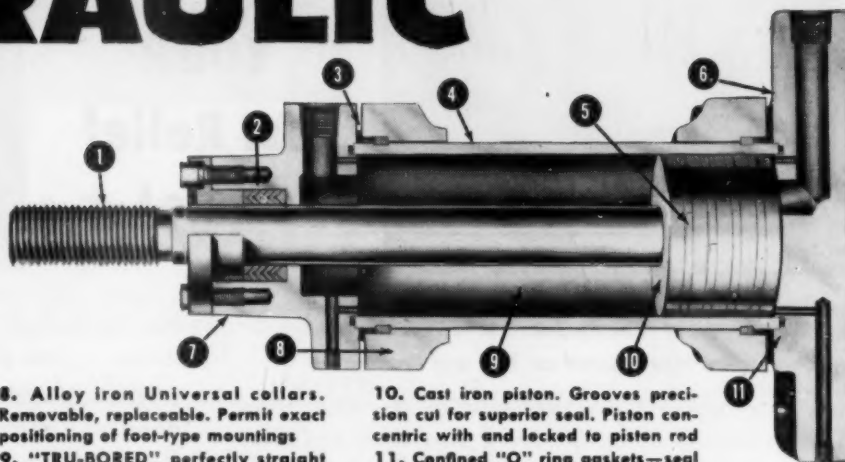
3. Alloy steel bolts—heat-treated for strength

4. Seamless steel cylinder. Extra strength. Piloted to end caps to assure concentric assembly

5. Positive seal piston rings. Lapped both sides for minimum oil slip

6. Alloy iron Universal end caps. Rugged. Port completely rotatable—air vents four sides

7. Cushioned caps when specified. Eliminate shock at end of stroke



8. Alloy iron Universal collars. Removable, replaceable. Permit exact positioning of foot-type mountings

9. "TRU-BORED" perfectly straight and round, then honed satin smooth.

10. Cast iron piston. Grooves precision cut for superior seal. Piston concentric with and locked to piston rod

11. Confined "O" ring gaskets—seal positively, cannot extrude

# CYLINDERS

## HANNIFIN "CUSTOM" HYDRAULIC CYLINDERS

● Built in quantity for use on customers' products

● Specially designed for each application

● Often the most economical way to buy hydraulic cylinders

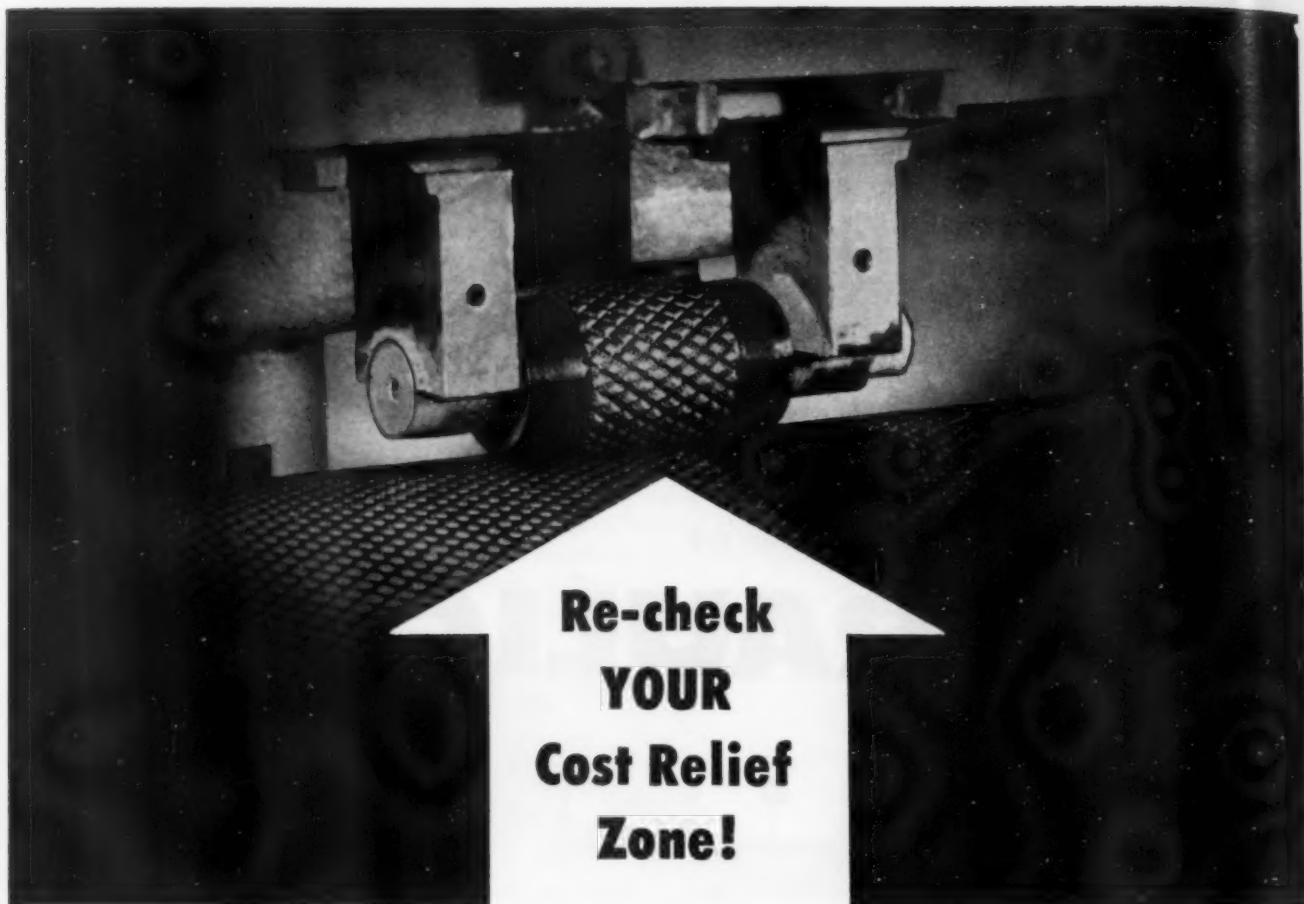


Bring us your cylinder problems.

# HANNIFIN

Hannifin Corporation, 1119 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves



## Re-check YOUR Cost Relief Zone!

**Hundreds of Other Men Responsible for Tooling and Production Have Acted on This and Profited!**

Here is a step you can take now to get relief from high production costs: *Re-check your tools and dies!* How much production time are you losing because of too frequent shutdown for die regrinding? How much *extra* money are you spending on costly die finishing, adjusting? Are your tools and dies breaking or wearing out too fast? A tool and die re-check will often give you the answers.

Take the job shown above. Knurling mills like this impress patterns on large .35% carbon steel rolls for embossing cloth and plastic. Some of the patterns are fragile and the sections as deep as 1/16" must not collapse. The mills must be hard enough to prevent upsetting, tough enough to prevent edges from breaking under pressures up to 5 tons. A re-check of the job showed that better performance could be expected if a more dependable die steel were used. Carpenter

No. 11 Special (Water-Hard) met all of these requirements . . . and provided the necessary cost relief.

If you're looking for immediate ways to bring costs down to a respectable level, act on this now. Use the Carpenter Matched Set Method to select the one steel best suited to cut costs. This Method is backed by *dependable* tool and die steels that *stay* on the job. Then, for rush delivery, call your nearest Carpenter Mill-Branch Warehouse or Distributor. THE CARPENTER STEEL COMPANY, 154 W. BERN ST., READING, PA.

### Are You Missing These Opportunities In Your Cost Relief Zone?

- Less die finishing and adjusting
- Greater output between grinds
- Fewer heat treating failures
- Less machine downtime

**On Job After Job Carpenter Matched Tool and Die Steels Have Made Them Possible!**

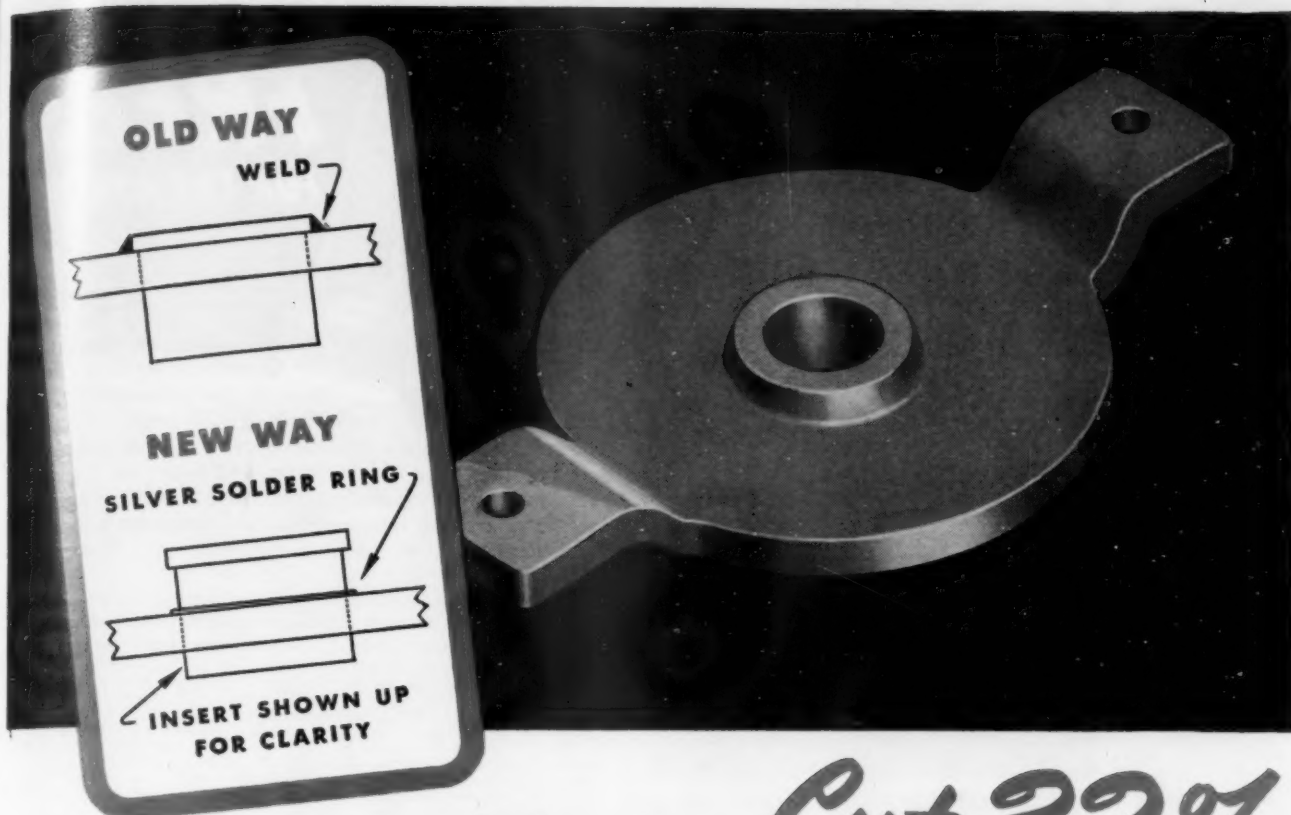


# Carpenter STEEL

**Matched Tool and Die Steels**

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"  
Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U. S. A. and Canada





# Assembly Cost *Cut 32%* with TOCCO\* Induction Brazing



**Now's the time to balance YOUR production budget**

This assembly may bear no resemblance to your product, but its case is typical of the savings accomplished by Induction Heating of metal parts of all sizes and shapes.

Formerly the Norris Thermador Corpora-

tion used arc welding to join the bushing and clamp shown above. In an effort to reduce costs TOCCO Induction Heating was brought into the production picture with the following results:

## OLD METHOD (Arc Welding)

Material (rod) . . . . .	\$ 4.56 per M parts
Labor . . . . .	20.63 per M parts
Overhead . . . . .	21.25 per M parts
Total Cost Old Method . . .	\$46.44 per M parts

## NEW METHOD (TOCCO Induction Brazing)

Material (solder and flux) . .	\$13.83 per M parts
Labor . . . . .	8.82 per M parts
Overhead . . . . .	9.08 per M parts
Total Cost TOCCO Method .	\$31.73 per M parts

TOCCO Engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.

**THE OHIO CRANKSHAFT COMPANY**

**NEW FREE BULLETIN**

**Mail Coupon Today**

**THE OHIO CRANKSHAFT CO.**  
Dept. G-7, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering."

Name \_\_\_\_\_

Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



# TOCCO

\*Trade Mark Reg.  
U. S. Pat. Off.

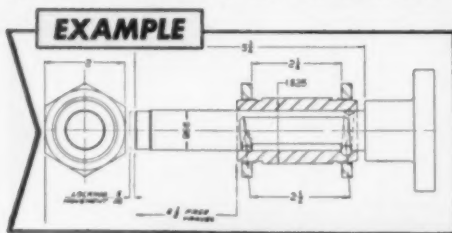


SPECIFY  
AND USE

# Morton

STANDARD FIXTURE CLAMPS  
AND COMPONENTS . . . .

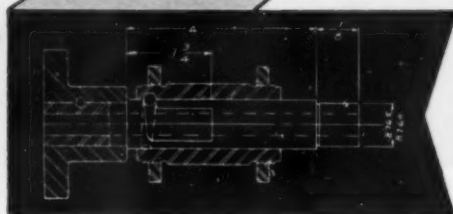
CAN BE MODIFIED TO FIT SPECIAL APPLICATIONS



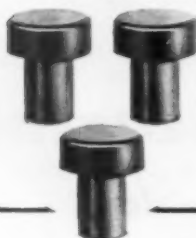
← MORTON  
STANDARD  
CL-25  
CAM LOCK

SPECIAL →  
MORTON CAM  
LOCK CLAMP

CL-25 . . . Modified for use by leading automotive plant.



• A SAVINGS OF \$62.35 ACHIEVED MORTONWISE ON THESE



3 REST BUTTONS COST

a leading manufacturer \$67.00 to make in his own plant. Now MORTONWISE he buys MORTON RB-3 for \$1.55 each.

● GREATER SAVINGS achieved on Jig

Feet, Rest Pads and other MORTON STANDARDS. Industry's largest selection of types and sizes of Fixture Clamps, Jack Locks, Cam Locks, Hand Knobs, Hand Wheels, Steel Ball Handles, Soft Chuck Jaw Blanks, Fixture Cams, Set-up Studs, Spherical and Plain Collar Nuts, Quarter Turn Screws, Fixture Keys, Spherical and Flat Washers, Shoulder Screws and allied items. Complete Assemblies or Individual Parts. Highest quality of workmanship and materials maintained.

Immediate delivery.

MODIFICATIONS TO SUIT YOUR APPLICATION

Write for: instructive, illustrative catalog. Contains full size tracing templates of each product, bound in loose leaf style for easy removal. Save tool and design costs with Morton.



**MORTON  
MACHINE WORKS**

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this new WELDING DESIGN MANUAL

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FOR THE ASKING



To assist you in your re-tooling problems . . . or to help you analyze your present welding methods so that you may enjoy maximum speed, efficiency, and economy in many of YOUR production problems...

Giant new 4th Edition contains 62 new photographs, 132 new drawings, 72 pages of helpful data covering basic and advanced welding techniques and designs used in fabricating and assembly. Profusely illustrated with application drawings; weld diagrams; tables of melting temperatures, strengths, corrosion factors; charts; alloy recommendations; etc. Convenient digest size.

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LAPPING OIL**

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**100% MORE**  
LIFE FROM YOUR  
DIAMOND  
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It's a fact that wet grinding will actually increase diamond wheel life as much as 100% through decreased wear. Stadoil removes all gum or glaze—keeps wheels from loading and enables the operator to get extra fine tool edges without pressure. Stadoil is recommended by all diamond wheel manufacturers for carbide tool grinding. It is an excellent thinner for diamond lapping compounds and as a carrier for diamond dust. OVER 6,000 INDUSTRIAL USERS. . . 18 years of industry service. Get Stadoil in 1/2 pint to 50 gal. quantities and see how Stadoil can cut your diamond wheel costs and increase tool life.

FREE—Proof that "Wet Grinding" Cuts Production Costs . . . Increases Wheel Life. Illustrated article prepared by leading tool analyst available on request. WRITE TODAY for Your Free Copy, direct to Dept. 5.



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If you are forming

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**Faster production  
at lower cost**

**MODERN  
COLLAPSIBLE  
TAPS**

*new*



**FOR EITHER  
STATIONARY OR  
ROTARY USE**

Modern Precision Tools  
Include . . . .

STATIONARY SELF-OPENING  
DIE HEADS  
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COLLAPSIBLE TAPS  
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COLLAPSIBLE TAPS  
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CHUCKS AND COLLETS  
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GRINDING FIXTURES

- Easy and quick adjustment. No special tools required.
- Interchangeable shank for convenience in changing from one machine to another.
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Send for full information on this new improved Modern Collapsible Tap and its cost reducing possibilities applicable to your tapping

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DIVISION

**CONSOLIDATED MACHINE TOOL CORPORATION**

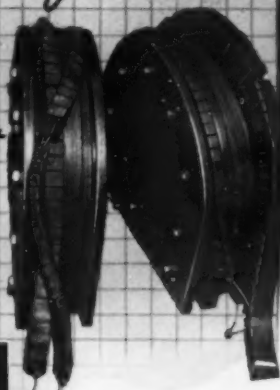
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

**ROCHESTER, NEW YORK**

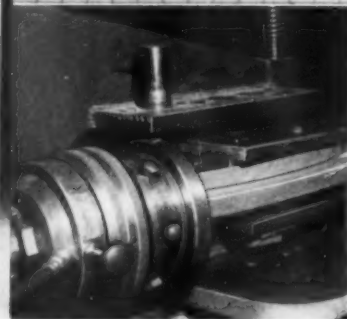


*If you are forming  
light metal parts*

*Hi Den  
has important  
advantages  
for you*



Above: Flexible "snake" of Hi-Den used on Hi-Den stretch die to support preformed walls of channel sections during stretch forming.



Left: Hi-Den die forming hat section on Hufford Stretch-Wrap Forming Machine. Section is 8" wide x 60" long, .040 thick 24 SO aluminum alloy. 75 ST alloy parts are formed on the same die.

Far stronger than equal weight in steel, lighter in weight, easier to fabricate and to handle. HI-DEN, a laminate of wood veneers impregnated with phenolic resin and compressed under extreme heat and pressure, is being used in some of America's largest light metal plants to **save up to 66% of tool-fabrication costs.**

Because it is easily shaped with standard tungsten carbide tools, has a low coefficient of friction, dimensional stability and is resistant to oil and moisture, users in the aircraft and other light metal industries have reported **more than 100 different applications for HI-DEN.**

**Truly amazing savings have been achieved with HI-DEN forming, stretch, draw and press-brake dies, Yoder rolls, jigs, fixtures, templates, and pressure pads.**

Why not send today for our Technical Bulletin and literature showing how to get increased production of improved quality products at lower cost with HI-DEN.

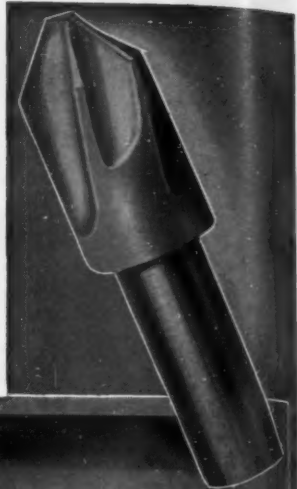
*PS*  
HI-DEN is ideally suited for use in Hydro-form and Mar-form presses.

**Parkwood  
Laminates, Inc.**

32 Water St., Wakefield, Massachusetts  
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## GROBET CHATTERLESS COUNTERSINKS

They are terrifically popular because the six staggered cutting edges are scientifically designed to give a shearing cut and thus eliminate all chatter. Made in 12 sizes in all degrees; also supplied as sets in strong Kit-cases.



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Sheet  
HC1

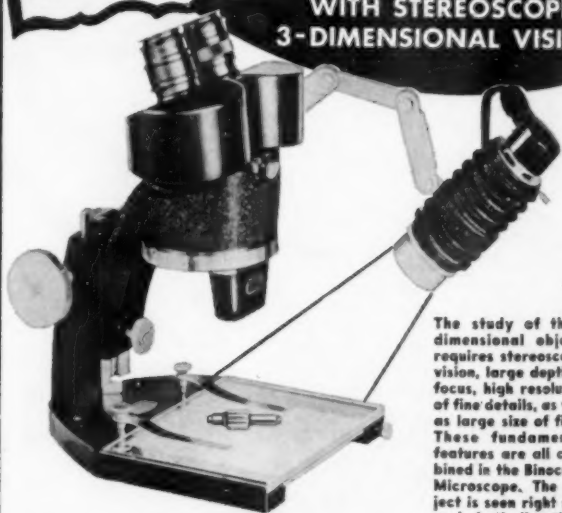


**GROBET FILE CO. of AMERICA, INC.**

421 CANAL STREET, NEW YORK 13, N. Y.  
USE READER SERVICE CARD; INDICATE A-7-230-2

**A NECESSITY  
For Every Shop**

**BINOCULAR  
MICROSCOPE**  
WITH STEREOSCOPIC  
3-DIMENSIONAL VISION



The study of three dimensional objects requires stereoscopic vision, large depth of focus, high resolution of fine details, as well as large size of field. These fundamental features are all combined in the Binocular Microscope. The object is seen right side up in both directions.

**SOME OF THE MANY USES**  
Balls and ball races for pits and flats, edges of razor blades and surgical knives, radio tube parts, watchparts, jewels; tools of all kinds; and control of surface finish in grinding and lapping operations.

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COMPLETE LINE OF PRECISION INSTRUMENTS

200-TE LAFAYETTE ST. • N.Y. 12, N.Y.

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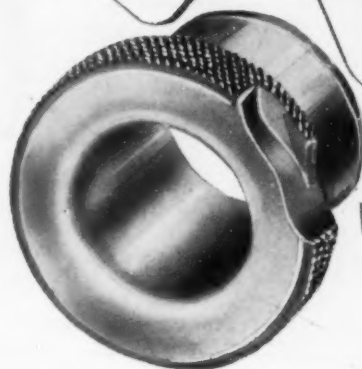
The Tool Engineer

**no confusing  
code numbers!**

**IT'S**

**3**

**D**



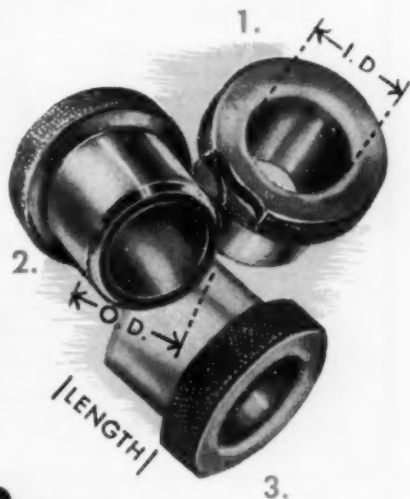
**WITH**

*American*

It's not new! For years American has used 3-D to simplify ordering drill bushings. American's original three dimension ordering plan; 1-I.D., 2-O.D., and 3-length, eliminates confusing code numbers...saves time, trouble!

Fully stocked  
distributors located in  
every major area  
throughout the U. S.  
You can get the  
right drill jig bushing  
when you want it!

Order American  
Drill Bushings  
the 3-D way...  
send for the new  
catalog with the  
**KING SIZE** selection  
of standard sizes.



**AMERICAN DRILL BUSHING CO.**

5107 Pacific Blvd., Los Angeles 58, Calif.

TRADEMARK



SPECIALIZING ONLY IN DRILL JIG BUSHINGS

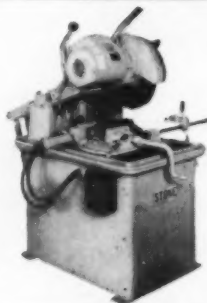
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You Can Cut All Metals  
At Less **4 SEC.**  
Than  
Per Square Inch

LOOK AT  
THESE  
TYPICAL  
CUTTING  
TIMES

CARBON STEEL	1" Dia.	3 Seconds
CARBON STEEL	1½" Dia.	6 Seconds
COLD ROLLED STEEL	2½" Dia.	15 Seconds
HIGH SPEED STEEL	2" Dia.	9 Seconds
CHANNEL	4"	6 Seconds
STEEL PIPE	2" O.D.	3 Seconds
ANGLE IRON	3x3x¼"	5 Seconds

MODELS AVAILABLE  
FOR ALL SHOP NEEDS

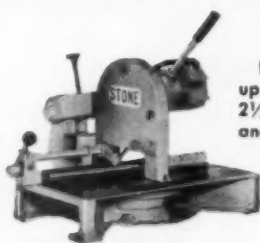
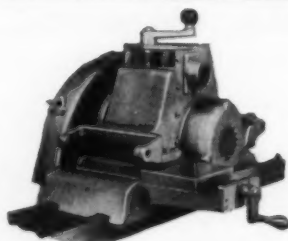


**MODEL M-75  
HEAVY DUTY**

For continuous production cutting of solids up to 2½"—pipe and structurals up to 4". Equipped with full 7½" h.p. geared-in-head motor engineered with positive drive for 33% greater efficiency.

**MODEL SS-20  
TRAVERSE TYPE**

Operates in horizontal plane on guided rails for cutting larger structurals, extrusions, sheet, plate with cuts up to nine feet in length. Cuts wet or dry.



**MODEL M-14**

Low cost machine for cutting solids up to 2"—pipe and structurals up to 2½". Two models—straight cut-off and swivel head for angle cutting to 45°. Bench or floor model. Equipped with full 3½ h.p. geared-in-head motor engineered with positive drive.

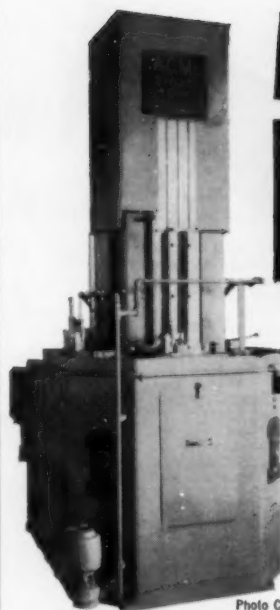
Write Today For Complete  
Information On These Machines

**STONE MACHINERY Co., Inc.**

402 Fayette St.

Manlius, N. Y.

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**SPLIT  
SECOND  
COOLANT FLOW**

with a  
**RUTHMAN  
GUSHER  
COOLANT PUMP**

This Acme Model U-31  
Broaching Machine is  
equipped with a Ruth-  
man Pump.

Photo Courtesy Acme Broach Corp.

You get plenty of coolant where and when you want it with a Ruthman Gusher Coolant Pump from the moment the machine is turned on. There is no packing or priming necessary and Gusher Pumps are designed for a long trouble-free life. Write us today, we'll be glad to advise you on your coolant problems.



**THE RUTHMAN MACHINERY CO.**

1810 Reading Road

Cinn., Ohio

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REAMERS ★**

Originators and  
Manufacturers of  
Helical Reamers  
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Helical Taper  
Pin Reamers  
Shipped by  
Return Mail

The  
**GAMMONS-HOAGLUND**  
Company

400 Main Street, Manchester, Conn.

USE READER SERVICE CARD; INDICATE A-7-232-3



# *Formbrite's* superfine finish eliminated buffing on these parts



For the temple bow illustrated, Sunware Products Inc., New Britain, Connecticut, makers of Rayex Sun Glasses, formerly used ordinary drawing brass and finished this part by hand buffing—one at a time.

This was a costly procedure, so a switch was made to Formbrite\* . . . then a happy thought occurred:

With Formbrite's superfine grain structure and added surface hardness, why not *tumble* these bows—by the thousands.

It was as simple as that. Formbrite's clean, smooth surface produced a jewelry finish—ready for gold-plating and lacquering. Since these bows are produced by the millions, the savings effected were substantial.

Formbrite, just in case you haven't heard, is a superior drawing brass. Comparative tests

prove conclusively that the superfine grain structure of this specially processed forming brass means stamped and formed products that are stronger, harder, "springier" and more scratch-resistant. Yet the metal is so ductile that it can be readily formed, drawn and embossed.

Time studies made of finishing operations have shown that a bright, lustrous finish ordinarily can be obtained by a simple "color buffing" operation—or by tumbling, if the product lends itself to this method.

And yet, Formbrite costs no more. Convince yourself that Formbrite is the metal for your product. Write for Publication B-39. Address The American Brass Company, General Offices, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.

6386

an **ANACONDA**® Product made by The American Brass Company

# DRILL OR TAP

all holes at one time regardless  
of angles with quickly-set-up

# MAGNA DRILL

ONLY with MAGNA DRILL can you drill or tap more than one hole in more than one plane at one time—*build the machine around the part in hours instead of days!*

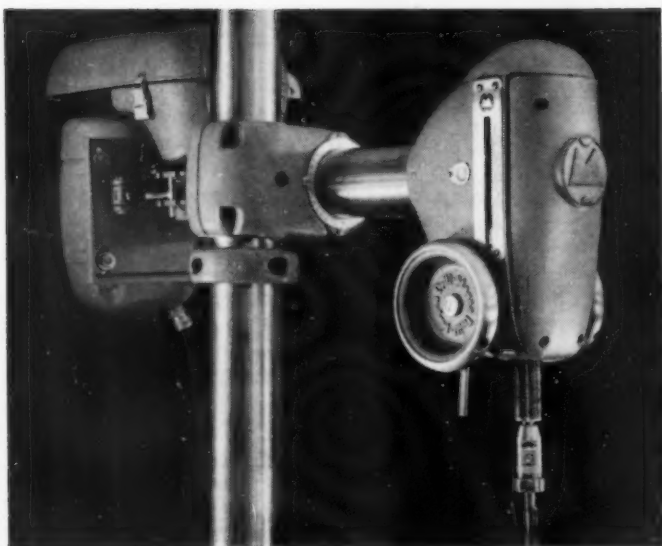
Only with MAGNA DRILL can you feed the drills simultaneously or in sequence by manual or mechanical power—*then remove the quills and substitute lead screw tapping units without knocking down or changing the set-up!*

Only with MAGNA DRILL can you realize all the economies of a custom-built, special-

purpose machine at a fraction of the cost—*then change the set-up completely using the same components to do an entirely different drilling or tapping job!*

And only with a demonstration can you realize the full cost-cutting potentials of MAGNA DRILL. See how many ways it can cut costs for you. It takes only a minute to send for the name of your nearest distributor plus complete details and specifications. Why not mark and mail the coupon now?

## MAGNA DRILL Components



### LEAD SCREW TAPPER

Why tap holes one at a time—even if they are at different angles? With MAGNA DRILL you can tap (as well as drill) holes simultaneously using the same basic MAGNA DRILL set-up. Only the spindles need to be changed—a quick, easy job. The special MAGNA DRILL lead screw spindle replaces the quill in the manual feed drill head. No change in set-up or jiggling required. No rewiring necessary.

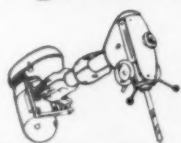
The lead screw tapping unit consists of (1) a reversing starter complete with wiring; (2) the lead screw and bronze nut assembly which replaces the normal quill and (3) a control plate with limit switches which mounts under the front cover. Starter has two-way switch for drilling or tapping.



## These Four Spindles

completely machine all drilled and tapped holes in four entirely different parts! Spindles are changed from drill to tap as required, proper jig bolted down. Equipment paid for itself in only five months!

## ...your keys to complete machine versatility



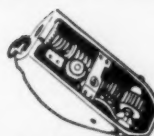
**DRILL HEADS** Individually powered, adjustable heads can be indexed and locked at any angle or position **without special tools**. Variable throat. Right or left hand manual feed.



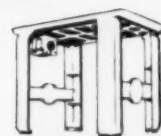
**COLUMNS and BASES** Tubes supporting drill heads are heavy  $\frac{3}{8}$ " wall,  $3\frac{1}{2}$ " O.D.; are precision ground. Bases are line-bored cast iron; mount horizontally or vertically.



**SPEED-REDUCING QUILL** Completely replaces regular quill in a few minutes' time. Reduces RPM by 4.4 to 1, spindle speeds down to 86 RPM with 1725 RPM motor.



**POWER FEED** (Mechanical Type) attaches to MAGNA DRILL head in a few minutes. Feed rates .003" to .012" per revolution. Solenoid engage. Spring return. Automatic cycling.



**TABLES** Drilled and tapped for mounting head in variety of positions and for ganging tables in multiples. Single table, 24" x 20". Double table, 24" x 40".

### Magna Drill Prices F.O.B. Destination:

DRILL HEAD (less motor)	\$265
COLUMN AND BASE	45
TABLE (24" x 20")	170
TABLE (24" x 40")	220
POWER FEED (mechanical type)	175
LEAD SCREW TAPPER	255
ADDITIONAL LEAD SCREW AND NUT	50
SPEED-REDUCING QUILL	150



**MAGNA ENGINEERING CORP.**, Dept. 245-K, at factory nearest you, 12819 Colt Rd., Cleveland 8, Ohio, OR Menlo Park, California

Send me name of nearest dealer and detailed specifications on MAGNA DRILL.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

July, 1953

USE FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-235

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July 1953 Issue

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

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OHIO—Richard E. Cleary, Commercial Bank Building, Phone: Berea 4-7719, Berea, Ohio

CENTRAL—Clarence T. Etter, 10700 Puritan Avenue, Phone: University 4-7300, Detroit 21, Michigan

WESTERN—Stanley F. Girard, 540 N. Michigan Avenue, Phone: Michigan 2-4465, Chicago 11, Illinois

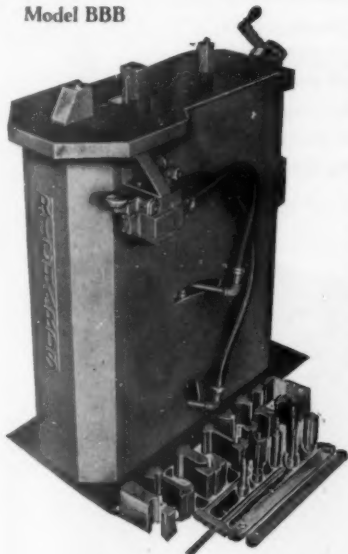
PACIFIC COAST—W. R. McIntyre, 423 First Trust Bldg., Phone: Ryan 1-6981, Pasadena 1, California

W. R. McIntyre & Associates, Room 1085, 681 Market Street, Phone: Douglas 2-4475, San Francisco, California

## MULTIFORM BIG BROTHER BENDER

**Produces Without Special  
Tooling—Saves Die Costs  
Saves on Expensive Presses**

Model BBB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to 1/4" thick by 4" wide. We also build smaller hand or air operated models for forming up to 3/8"x1 1/2" material.

Send for illustrated folder TE-5

**J. A. RICHARDS CO.** 903 North Pitcher St  
Kalamazoo, Michigan  
USE READER SERVICE CARD; INDICATE A-7-237-1

July, 1953



## HELICAL SPIRAL TAPER PIN REAMER

featuring

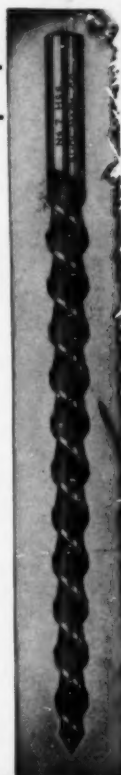
**Continuous change in lead angle to  
compensate for continuous change in  
diameter.**

- This feature insures uniform depth of radial undercut (shear) on the entire length of the taper and provides uniform relief at all points on the diameter.
- In stock for immediate delivery sizes #6/0 thru #10. Made promptly to order sizes #11, 12, 13, and 14.
- Backed by 27 years of manufacturing reamers exclusively. We also make Stub Reamers, Die Clearance Reamers, and Special Reamers to your exact specifications.

MANUFACTURERS' AGENTS: Exclusive territories open outside of New England and metropolitan New York. Write us.

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**REAMERS EXCLUSIVELY**  
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*better*

**PUSHERS**



"Reduced Type" Feed Finger



Squirrel Cage Pusher

Extraordinary production records with a wide range of feeds and speeds are not unusual on machines equipped with Benco Pushers or Feed Fingers. Benco Pushers are engineered and built to provide efficient, dependable feeding and the elimination of stock scoring. Continued dependable performance at lower production costs with resultant savings of time and money may depend on the proper selection of pushers and feed fingers....choose Benco and you'll choose the finest.

Always Better Constructed  
Accurate Benco Collets, Pushers and Pads

**BENCO COLLET MANUFACTURING COMPANY**  
CLEVELAND 14, OHIO



CHANGE CUTTERS WITH A

**TWIST of  
the WRIST**

TOOL UP WITH

**CONTINENTAL  
DRIVE**



With Continental Standard Drive Holders you can change cutters with a twist of the wrist no matter how severe the operation has been. This will save you time and save your tools.

It is as simple as this: The Continental Standard Drive consists of integral double driving lugs on the shank of the cutter which engage double abutments in the socket of the holder. Double aligning bearings keep the cutter and holder in rigid alignment. The drive is machined from the solid—there are no pins or loose details. Result—a balanced, positive drive which is non-wedging and practically indestructible.

Available in standard counterbores, spot facers, countersinks—and on special tools such as multiple-diameter cutters, step counterbores, radius and chamfering applications. It is equally applicable for inverted operations.

Order through your Ex-Cell-O representative or direct from Continental Tool Works in Detroit.



Continental Counterbores may be purchased individually or in sets. Write on your company letterhead for Catalog 60681.



**Continental**  
**TOOL WORKS**

DIVISION OF EX-CELL-O CORPORATION  
DETROIT 32, MICHIGAN

# BENCO

*better*

**PUSHERS**



"Reduced Type" Feed Finger



Squirrel Cage Pusher

Extraordinary production records with a wide range of feeds and speeds are not unusual on machines equipped with Benco Pushers or Feed Fingers. Benco Pushers are engineered and built to provide efficient, dependable feeding and the elimination of stock scoring. Continued dependable performance at lower production costs with resultant savings of time and money may depend on the proper selection of pushers and feed fingers...choose Benco and you'll choose the finest.

*Always Better Constructed  
Accurate Benco Collets, Pushers and Pads*

**BENCO COLLET MANUFACTURING COMPANY**  
CLEVELAND 14, OHIO

CHANGE CUTTERS WITH A

# TWIST of the WRIST

TOOL UP WITH

## CONTINENTAL DRIVE



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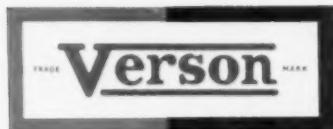
# Continental

## TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION  
DETROIT 32, MICHIGAN



# A Verson Press FOR EVERY JOB...

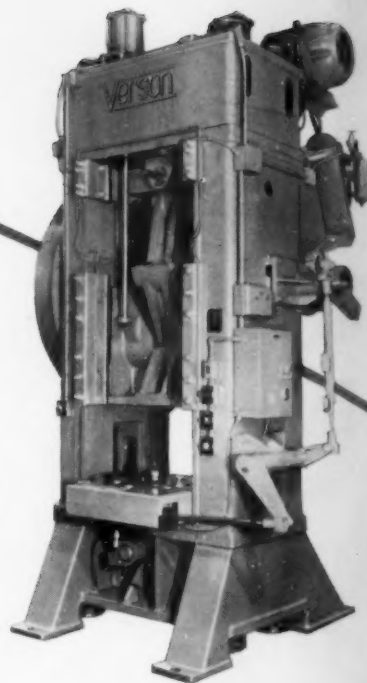


## KNUCKLE PRESSES

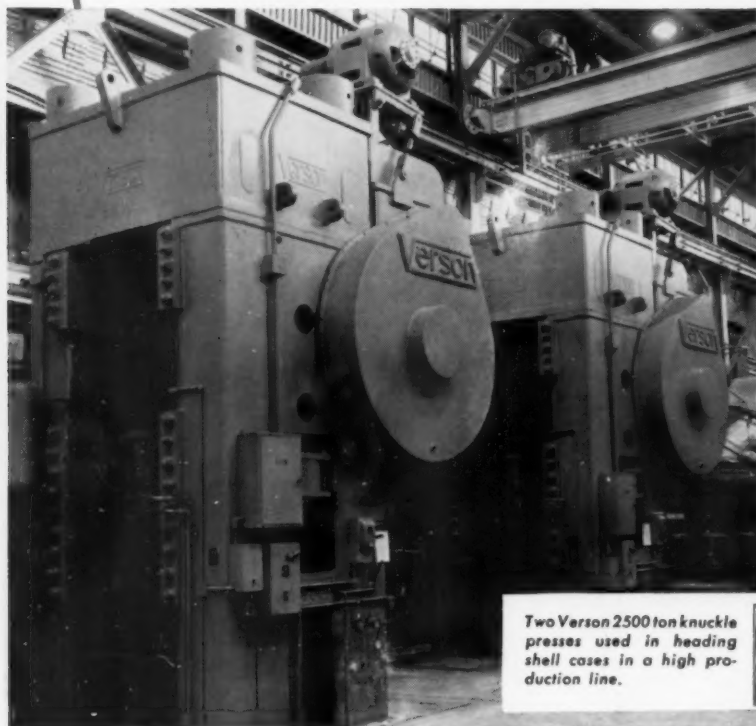
A Complete Line from 100 to 6000 tons

### Features—

- Longer toggle arms to minimize thrust on gibs.
- Greater saddle areas for reduced bearing pressure.
- Gears running in oil.
- Hi-pressure flood type recirculating system for knuckle lubrication (presses over 1000 tons).



A smaller Verson knuckle press of 400 tons capacity with dial feed.



Two Verson 2500 ton knuckle presses used in heading shell cases in a high production line.



Close-up of die space of 2000 ton Verson knuckle press. Note the very rugged construction.



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